ELECTRICAL REVIEW

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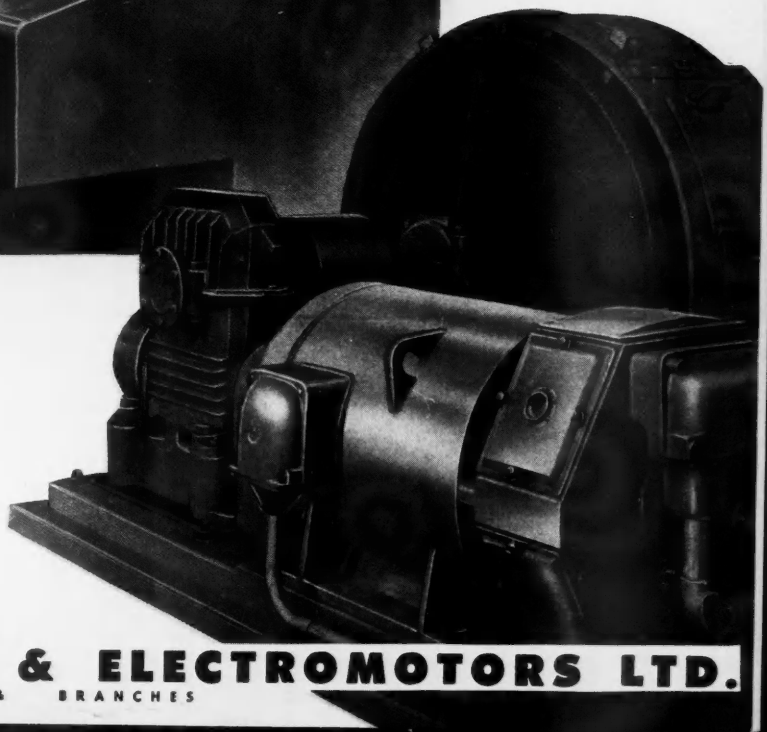

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ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E.
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11 MARCH 1955

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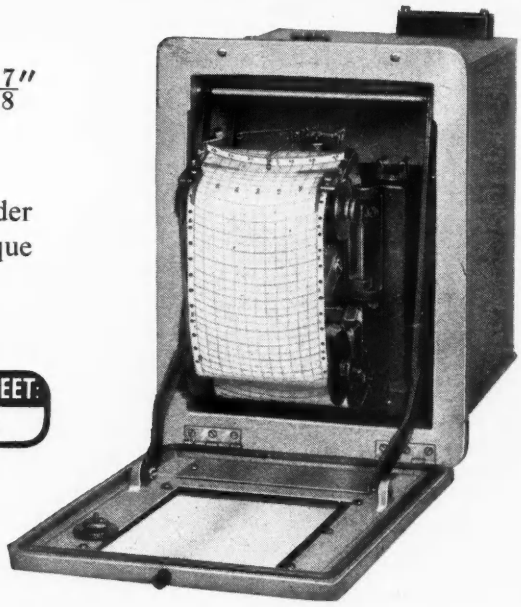

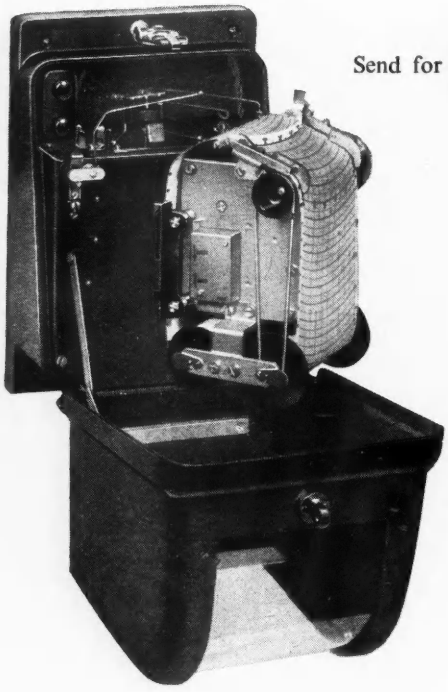

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ELECTRICAL REVIEW

11 March 1955 Vol. 156 No. 10 Established 1872

Power for Rhodesia

THE decision of the Central African Federal Government, announced last week by the Prime Minister (Sir Godfrey Huggins), to proceed with the Kariba hydro-electric scheme settles a question which has been under discussion for some time. The choice lay between the Kariba scheme on the Zambezi in Southern Rhodesia and the Kafue scheme on a tributary of the Zambezi in Northern Rhodesia.

Apart from the respective merits of the schemes, there was some territorial rivalry in the dispute. Both Rhodesias naturally desired development of their own resources and in Northern Rhodesia the copper-mining interests added their weight to the demand that the Kafue scheme should be proceeded with first, and actually that project had been given precedence. As recently as last May Sir Roy Welensky, then acting as Federal Prime Minister, said that no change was contemplated in the Federal Government's decision to proceed first with the Kafue scheme.

Later, French consultants, after examining the schemes reported that both would be necessary by 1970. They favoured going ahead with the production programme for Kariba while the first stage of the Kafue development was also put in hand. The report appears to have been accepted and last week Sir Ernest Oppenheimer, chairman of the important Rhodesian Anglo-American group of copper producers, announced that his group would fully support the decision. The Prime Minister had given an assurance that the mines' power requirements would be satisfied by the provision of a link between Southern and Northern Rhodesia.

A great deal of capital will be required—£54 million for the first stage of Kariba and ultimately £86 million. A small part (£8 million) would be provided by the Federal Government and the International Bank is studying the proposals. It is not proposed to raise any part of the capital in London. Sir Godfrey Huggins has said that the decision to embark upon the Kariba scheme is subject to two provisos. First, that the French consultants' final technical appraisal confirms their earlier conclusions and second that there is a favourable opinion on the part of the International Bank's economic mission. The total cost of both the Kariba and Kafue schemes is estimated at over £140 million.

Rapid action is promised by Sir Godfrey Huggins, who has spoken of the keen interest of the United Kingdom Government in this important project. This interest is shared by British electrical manufacturers who will hope to secure a substantial part of the orders for the necessary plant and equipment.

LAMP MAKERS' DECISIONS

It will be remembered that the Monopolies Commission in its report upon the electric lamp industry recommended that certain restrictions imposed by the Electric Lamp Manufacturers' Association should be relaxed. Last week the Minister of Supply announced that the Association was taking steps to comply with the Commission's recommendations. Details are given in our Parliamentary News. Generally the Association agrees to cease to enforce price maintenance by means of fines and a " stop list "; it is to make components available to non-members; and the sales quota system, exclusive dealing arrangements and payments to associations of distributors are ended. The limits on the production and quality of " Type B " lamps are removed and retailers are to be permitted to give deferred discounts to purchasers (a provision which appears to relate to co-operative societies). E.L.M.A. lamps are so well established that the effects of these decisions should not be serious to the makers. The latter have long been a target for criticism, and the removal of the causes (real or imagined) may be reckoned on the credit side.

MAMMOTH GENERATORS

Such is the reliability of modern steam-raising and generating plant that there is now no hesitation on the part of electricity supply authorities to put a great many eggs in one basket. Of course in large interconnected systems the adverse effects of a possible breakdown are greatly reduced but all the same the growth in the size of individual generating sets is an indication of faith. The tendency towards ever larger units was seen first (perhaps naturally in that land of the gargantuan) in the United States but now we are matching them here. The British Electricity Authority already had a number of 100 MW and 120 MW sets in its future programme but last week it announced that it had placed an order for a 200 MW set with a boiler to match (*Electrical Review*, 4th March, p. 353). Shortly before that announcement it was reported that the Niagara Mohawk Power Corporation was installing a 200 MW unit in its Huntley plant in New York State. This, it is said, will raise the plant capacity to 1,000 MW, which is the planned figure for the High Marnham station in which the British set is to be installed.

INTERFERENCE SUPPRESSION

Presumably because refrigerators are apt to start up at any time their manufacturers, assemblers and importers are to be required to fit radio-interference suppression devices before selling them. The other new regulations, applying to small electric motors in domestic appliances, do not affect the manufacturers of this equipment. The onus is placed on the owners of the appliances but they will apparently be enforced only after complaints have been made to the Post Office. Manufacturers are under no compulsion to fit suppressors as yet. The Postmaster General hopes that there will be a progressive extension of the practice of certain manufacturers who produce appliances which provide for the quick addition of a suppressor if it proves necessary. During the next two years the question of applying the regulations to manufacturers is to be " reviewed." In the meantime a claim that an appliance is " suppressed " may be a selling point.

THE INDUSTRIAL FUTURE

Mr. G. L. E. Metz's I.E.E. paper on the part of the electrical engineering industry in the national economy was somewhat pessimistic and sometimes disparaging. It evoked a spirited defence of the industry from Col. B. H. Leeson, director of the B.E.A.M.A., when it was discussed last week. Col. Leeson showed that of all British industries the electrical industry was the one which knew where it was going and what it had to do to help maintain the country's position in the world. He deprecated the insistent comparison of industrial development in Great Britain and the United States to this country's disadvantage, pointing out the vast difference in circumstances. Although he agreed that we could spend more on research, he denied that we were devoting as little to that object as the author suggested. Having said so much, Col. Leeson did think that our people should work harder and he especially advocated the two-shift system in order to get more out of the heavy capital investment in the industry. He concluded with an expression of his conviction that Great Britain, and particularly the electrical industry, would rise to the demands made upon it in the future.

TORONTO SUBWAY TRACTION

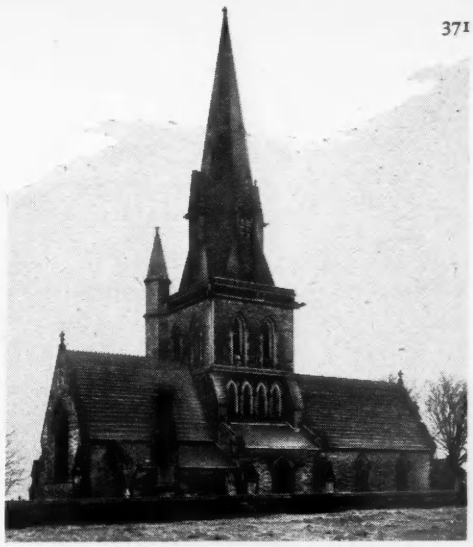
Although built in this country the cars of the Toronto underground railway differ in many details from those in use here. Apart from variations due to climate and other local conditions, such as the need to provide more than twice as much passenger-heating capacity as in Great Britain, the opportunity has been taken to introduce a number of unusual features. These were described in Mr. F. W. Roberts' I.E.E. paper, some particulars of which are included in this issue. A notable instance is in the mechanical transmission, which eliminates spur gearing and incorporates a right-angle-drive gear box. The author suggests that the axle-suspended motor may be nearing the limit of its development for urban traction and that this method may help to meet competition from road transport. In simplifying the application of high-speed traction motors, it appears to offer appreciable advantages.

FLOOR POLISHERS

Continuing our series of illustrated surveys of domestic electrical appliances, next week (18th March) we shall be dealing with floor polishers. Particulars to be given in tabular form will include details of the type, motor, finish, price, purchase tax, etc. In the next survey (15th April issue) the subject will be refrigerators

Church Heating Installation

Electric Hot Water Circulator Replaces Coke-Fired Boiler



By R. L. GAUNT*

THIS article shows how the intermittent heating of a church by a hand fired coke boiler and the difficulty of finding suitable labour capable of undertaking adequately the attention needed for the proper firing of the boiler were replaced and overcome by the installation of an electric hot water circulator, confirming that electric heating by this method, coupled with a suitable "off-peak" tariff, should appeal to the large number of church authorities who meet this problem. The results will also be of interest now that the Central Council for the Care of Churches have issued some notes† on this matter.

The building itself was designed by Sir Gilbert Scott, is stone built throughout, and was erected during 1852–53. Some indication of the heating problem is given by the height of the structure, the number of windows and the floor area which is approximately 3,000 sq ft. The building will accommodate 300 people, and normally two services are held each week, both on Sunday, with an additional early service on one Sunday each month. The main heating problem is thus to have the building comfortably warm for those people who attend these services and, at the same time, to provide adequate heating for all occasions. Fig. 1 shows diagrammatically the original heating system with the coke fired boiler in the basement and the layout of the piping and positions of the radiators. The only additional heating is that provided in the chancel by means of a 15 A outlet used for a portable radiator and further 15 A outlets installed for portable radiators, one in the vestry and one near the organ.

The coke boiler and three portable electric radiators have been used for heating the building for the last twenty years with very indifferent results; firstly because the unskilled labour employed for stoking the boiler did not give the regular attention needed to keep a good fire to maintain the proper temperature in the building, secondly, one of the four hot water radiators (that near the west door) was removed following a defect, and instead of being replaced the piping was straight jointed through, thereby reducing the effective heating surface area by approximately 20 per cent, and thirdly because the electric radiators had only a very limited area of application.

The difficulty of finding labour, and the risk of damage to any solid fuel fired boiler by unskilled labour, called for reconsideration of the whole heating problem, and in 1951 costs were obtained for a replacement of the coke hand fired boiler either by a boiler with automatic stoking, or by an oil fired boiler, again with automatic control, or by some form of electric heating. An examination of these alternatives seemed clearly to show there were advantages in a simple and automatic method of heating, and that whichever method was adopted it should be so arranged that the labour problem did not arise.

Because of the good condition of the existing hot water pipes and radiators, and the ease with which it was possible to adapt these to electric heating, it was decided they should be retained, and that steps should be taken to examine in detail a scheme for the installation of a 36 kW electric hot water circulator (equivalent to the rating of the coke boiler) connected to the existing heating system and, after satisfactory arrangements had been made confirming the possibility that such a system would adequately heat the building, an order was placed and the equipment finally installed in March, 1952. The equipment has been conveniently housed along existing wall space without undue interference with the existing accommodation. The control panel includes the contactor gear for the circulating water pump, along with contactor gear for thermostatic control at two points in the building and on the circulator itself. Provision has also been made for the installation at some future date of contactor gear for any additional radiators that may be installed in the chancel. Additional control is installed as a safeguard against frost and in this event only one-third of the installation is put into circuit, which is regarded as being sufficient to keep the installation free from frost damage. The whole installation has supervisory time switch control or, alternatively, hand control. The time switch and overriding hand control are shown above the control panel in the illustration on page 373.

Also housed on the control panel is a time switch provided

* The author is a member of the Church Council responsible for installing the heating equipment described in this article.

† "Church Heating (XI)" published 1954 for the Central Council for the Care of Churches by the Church Information Board.

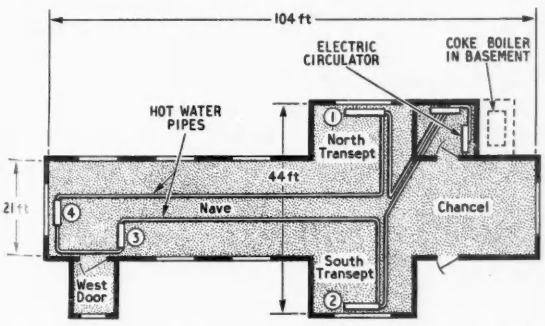


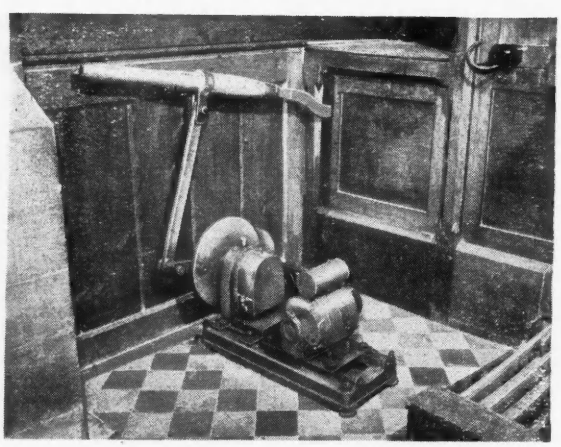
Fig. 1.—Diagrammatic layout of original hot water heating system

Left: View looking towards chancel (showing type of hot water radiator and piping). Right: View looking towards nave (giving an indication of the height of the building)

by the Electricity Board in accordance with the arrangement made for the adoption of their off-peak tariff, which cuts off completely all supply to the circulator during the Board's peak periods.

The capital expenditure items are as follows: 36 kW circulator complete with control panel, thermostats and time switch, £203; directly driven centrifugal pump complete with motor and contactor gear, £34; alterations to pipe-work with additional plumbing work, £78; provision of additional electrical installation and switchgear between point of supply, control panel and circulator, £76; additional double cast-iron radiator, £20; total, £411.

The total capital costs of the alternative schemes considered in 1951 ranged from £185 to £350. Prior to the decision to adopt this form of heating it was calculated that it would be possible to use the installation only during the off-peak periods of the Electricity Board and the loading of the boiler was designed with that in mind although it was given sufficient loading to increase the temperature inside the building to approximately 60 deg F. There was, however, one difficulty which gave rise to some anxiety, namely, Saturday morning was not regarded as being an off-peak period, but it was finally decided that a risk could be taken in this matter on the assumption that the installation was designed to deal with the normal winter temperature and would be adequate to raise the temperature between 12 noon Saturday and 10 a.m. the following day to the required amount. It was, therefore, decided to accept the Board's off-peak tariff available at that time of 0·625d per kWh, subject to the equipment not being used outside off-peak periods.



Method of converting hand blower of organ to electric drive, with cover removed (belt driven domestic washing machine gear box, ½ h.p. motor with "on" and "off" limit switch on bellows for automatic control)

The equipment has been in use two years and the results amply confirm the estimates made in 1951. The details of the annual consumption and the amount paid for it are as follows: Year ended 31st March, 1953, kWh used, 20,800, amount paid £54; 1953/54, 15,400 kWh, £40. The reduction in running costs for the year 1953–54 is due in part to the milder winter and partly to the closer supervision of the control of the equipment by hand operation instead of automatic control, resulting in a shorter period of operation, namely about 12 hours instead of 24 hours, than in the previous year, and this enabled the time switch periods to be altered accordingly for future automatic control.

These annual costs compare with the more recent previous costs for the coke fired boiler, which for coke and labour amounted to an average of £45 per annum, with coke at £5 per ton. In assessing the costs of the various schemes for future operation, it was assumed there would probably be an increase in the cost of coke and that certainly local labour would cost more than during the last 20 years and, therefore, it was estimated the probable comparable cost would be something between £60 and £65 per annum.

Fuel technologists will, no doubt, be unwilling to accept these figures and will say that with skilled labour it is possible to heat the building at a lower annual cost than is

disclosed by the electrical method, although that in itself is very doubtful, but they must accept the position that in country districts, and in a large number of towns, it is not possible to find and employ labour capable of stoking solid fuel fired boilers, so that other alternatives must be found which, even if they involve a somewhat higher capital expenditure, show a lower annual operating cost. In the case described, even apart from the automatic operation of thermostats and the time switch, the overriding manual control enables anyone, however unskilled, to start up the equipment by the operation of the customary tumbler switch and, similarly, the same easy method is, of course, used to close down the heating installation. All that is necessary is to advise those concerned beforehand of the period during which the equipment should be in use.

With the existing pipe-work and radiators it has been possible to set the thermostat on the circulator at a maximum temperature of 180 deg F (the circulator is of course very well lagged), and this has shown that with the lowest temperatures so far experienced in the two winters concerned, this is adequate to maintain a temperature of 55 deg F in the nave which is warm enough for a short period of an hour or so during which the services take place.

One outstanding advantage of equipment of this description is its reliability and the lack of need for any experienced individual to be available to operate the heating apparatus. The only maintenance that appears necessary, and this has not yet been required, is to replace the contacts on the contactor gear, but with the limited operation of the thermostats and more use being made of the supervisory hand control, even this small amount of maintenance will not be necessary.

Fig. 2 illustrates one of several thermograph records which have been taken during the coldest spells in the two winters concerned, and it will be seen that over a period of

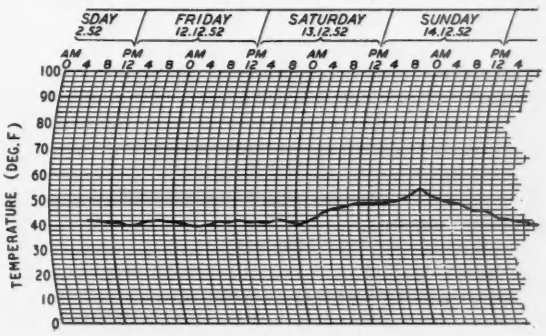
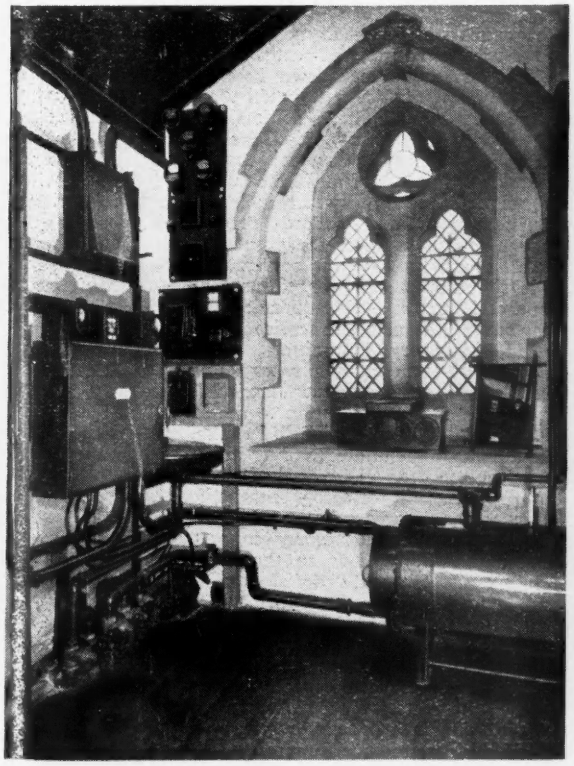
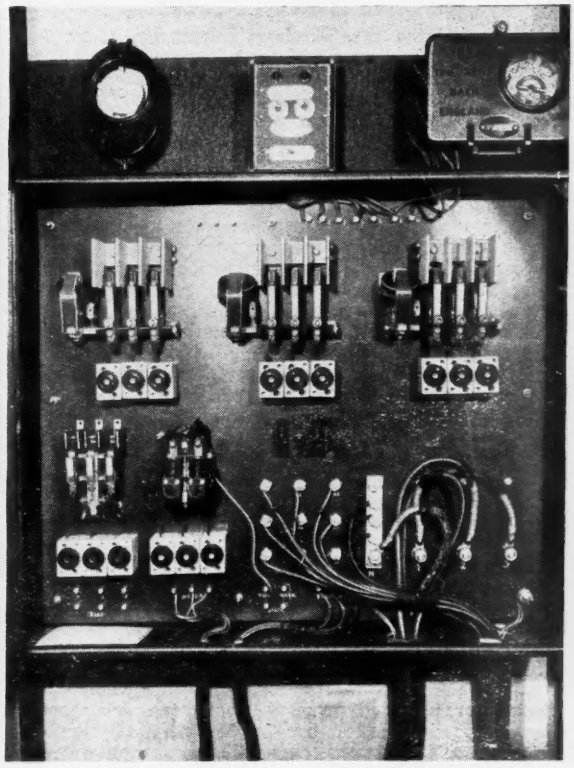


Fig. 2.—Thermograph record taken inside building

24 hours, with a minimum outside temperature of 20 deg F, the inside temperature of the building has been raised from 40 deg F to 55 deg F between 12 noon on 13th December, 1952, and 11 a.m. on Sunday 14th December. The average period of operation is, however, not more than 12 hours, and this is adequate to give a temperature of 55 deg F inside the church. One improvement which can be made to the installation is to reduce the slight hum of the pump and motor which, when in operation, is transmitted over the whole of the pipe-work and radiators. This will involve the installation of a fibre or rubber joint between the pump itself and its connection to the pipe-work. The pump and motor are mounted on rubber foundations and arrangements have been made to proceed with the installation of this insulated joint. Provision has also been made for the installation of suitable valves permitting the pump to be disconnected without the inconvenience of emptying the whole of the water from the pipe-work and

Circulator, control panel, pump and metering and (right) detailed view of control panel





radiators which would be necessary when stripping down the plant for the insertion of such a joint and any other maintenance on the water system.

There are probably other similar installations in use in the country, although the notes referred to above (Church Heating (XI)) do not mention this method of church heating, and at the time the Council were discussing the matter no information was readily available from other sources of such installations which would give confirmation of the effectiveness of this method, and it is hoped these actual operating results will be of interest to those who come across similar problems.

Some may argue that adequate heating could be provided by means of heating tubes in the pews, panel heating, convectors or unit heaters, at selected points in the building with the same satisfactory automatic operation and control, at no greater annual running cost than the circulator installed. But from the extensive inquiries made and from available information of such installations in similar buildings there was no satisfactory evidence, either on annual operating costs, installation costs of equipment or the complete effectiveness of either type of heating, whereas there was evidence that the existing pipe-work and radiators were in themselves suitable for heating the building, provided sufficient energy was supplied at the source.

The existing lighting load amounts to 4·7 kW, including four 250 W floodlight fittings fixed inside and in the roof of the nave; the heating load is 7 kW; and there is a 0·5 h.p. motor for the organ blower. It may be of interest to refer to the running cost of these existing supplies, as distinct from the electric circulator running costs, and the details are as follows:—

Year ended 31st March	kWh consumed		Total kWh	Amount paid	Average price d/kWh
	Heating & power	Lighting			
1952/53	641	654	1,295	£25	4·65
1953/54	308	1,074	1,382	£25	4·35

The increase in the number of lighting kWh in the second year was due to an additional weekly evening service and choir practice, and the reduction in heating kWh was due to less use of the portable radiators because of the effectiveness of the electric circulator. The supply to this installation is provided by a 3-phase overhead service from the low voltage distribution mains of the Yorkshire Electricity Board on the Board's off-peak tariff, now fixed at 0·675d per kWh; but the conditions attached to the tariff are designed to meet the many varying conditions applying to the electrical installations in churches, and its introduction gives an opportunity to church authorities to examine the benefits that can be obtained by the use of such a tariff not only for heating installations but also for lighting and small power installations.

It will be seen that the total operating costs for this building providing heating by the electric circulator, lighting, small power and other heating for a full year, amount to approximately £70, and the Church Council are satisfied the adoption of this off-peak tariff has completely solved their heating problem and its adoption for the remaining lighting, heating and small power installation will effect a saving of approximately £20 a year.

Interference Suppression

ON 1st March the Wireless Telegraphy (Control of Interference from Electric Motors) Regulations, 1955, and the Wireless Telegraphy (Control of Interference from Refrigerators) Regulations, 1955, were laid before Parliament. They give the Postmaster-General power to control interference with radio (including television) from refrigerators, and from domestic and industrial appliances driven by small electric motors, e.g., vacuum cleaners, hair dryers, and drills, which are the commoner sources of interference with sound broadcasting and television reception.

Both sets of regulations come into force on 1st September next and lay down the requirements which must be complied with (*a*) by manufacturers, assemblers, and importers of all electrical refrigerators and (*b*) by users of new and old electric motors. These arrangements were recommended by the Advisory Committees appointed under Section 9 of the Wireless Telegraphy Act, 1949, and the regulations have been drawn up with their agreement.

It is pointed out by the General Post Office that the introduction of the electric motors regulations does not mean that everyone using a vacuum cleaner, hair dryer, or other domestic electric article will have to fit a suppressor at once. Only a proportion of these appliances cause interference and the Postmaster-General hopes that in such cases the owners of the appliances will co-operate by having the trouble put right when it is pointed out to them by the Post Office. The new powers will be used only where it is necessary for the Post Office to insist on an appliance being put right because it causes interference and the owner will not voluntarily have a suppressor fitted.

The Postmaster-General hopes that there will be a progressive extension of the current practice of certain manufacturers who produce appliances incorporating suppressors or who provide for the easy addition of a suppressor if it proves necessary. The question of making the regulations for small motors apply to manufacturers is to be reviewed during the next two years.

The standards laid down in the regulations, i.e., the limits of interference and the frequency ranges over which they are to apply, have necessarily been based on data derived from existing sound and television broadcasting services, for which they are designed to give adequate protection in areas of moderate field-strength, provided the receiving installation, which includes the aerial system, is satisfactory. The standards are also expected to give adequate protection to the proposed frequency-modulated v.h.f. sound broadcasting service in Band II (87·5 to 100 Mc/s) and to go some way towards eliminating interference in the higher range of frequencies (Band III) to be used for the new I.T.A. television service.

The Advisory Committees, when submitting to the Postmaster-General their reports upon which the present regulations are based, recommended that information should be issued drawing attention to the importance of earthing in accordance with the I.E.E. Regulations for the Electrical Equipment of Buildings. For many types of appliances used in situations where earthed metalwork is present, these Regulations call, for safety reasons, for the exposed metalwork of appliances to be earthed; earthing is even more important when interference suppressors are fitted to an appliance. Exceptions to the earthing requirement are "all-insulated" and "double-insulated" appliances, and appliances used in "earth-free" situations. It is also important that components of suitable quality should be used for interference suppression, and that they should be connected in circuit in a suitable manner. These two aspects are dealt with respectively in B.S. 613 "Components for Radio Interference Suppression Devices" and the forthcoming B.S. Code of Practice on "The General Aspects of Radio Interference Suppression."

Kariba Gorge

Construction of Hydro-Electric Scheme to go Ahead

THE Government of the Federation of Rhodesia and Nyasaland has now decided to construct the Kariba hydro-electric scheme on the River Zambezi, in preference to that on the River Kafue a hundred miles away.

Announcing this in the Federal Parliament last week Sir Godfrey Huggins, the Prime Minister, said that the first stage of the scheme was to be proceeded with, involving an installed capacity of 462 MW. The cost of building the dam and installing the first six machines would be about £54 million, including interest charges during the construction period. The major reason for the final choice was that the hydrology of the Zambezi and the Kariba catchment was well known, flows having been measured and recorded over many years. Also, after completion of the first stage, additional power could be obtained by adding further generating sets. The project was involved in a major policy decision which would result in the Federation relying in the future on hydro power instead of thermal. With this aspect in mind the Kafue scheme would be inadequate by 1963.

The Federation expects to provide £8 million of the necessary capital, the remainder being found from sources other than the London market, including the International Bank which has been invited to send an economic mission without delay to investigate the project. Sir Godfrey said he had good reason to believe that finance was in sight to cover the whole amount required.

The copper mines in Northern Rhodesia expect their demand to increase sharply by 1959 and the Government considers it feasible to supply this increased demand from the Southern Rhodesian thermal system until Kariba is operating. This system is expected to have a temporary surplus in 1959, and would supply the north by a 220 kV transmission line from Umtiali, passing through Kariba and Kafue to allow for the later development.

Construction of the Kariba scheme involves the building of 90 miles of railway line from Sinoia at an estimated additional cost of about £4 million, although, as this would form part of a projected rail link from Sinoia to Kafue, only a small proportion would be properly chargeable to the power scheme.

The decision by the Federal Government comes shortly after the report, recently published, of the French mission headed by M. André Coyne and charged with the investigation of both the Kariba and the Kafue schemes. This recommended the construction of a gravity arch dam 400ft high and 1,850ft crest length, forming a reservoir 150 miles long and giving an output in the driest years of 6,500 million kWh. The site recommended is approximately 1½ miles downstream from the start of the gorge. Two power stations, one on each side of the river downstream of the dam, were recommended, only that on the right bank to be built at present. Connection with load centres would be made by two transmission lines from Kariba to Kitwe in N. Rhodesia, four to Umniati and two to Norton. The major lines would operate at 220 or 275 kV.

Some of the costs in the completed scheme would be as follows: mechanical and electrical plant, £21 million; civil engineering works, £20 million; transmission, £23 million; preliminary works, £100,000; access roads, £750,000; and contingencies and engineering, £10 million. The total cost of the whole scheme would be about £88 million.

The cost of energy from Kariba at the receiving sub-stations would be 0·286d/kWh in the first stage and 0·254d in the second stage.

An earlier report, published in July, 1951, gave the recommendations of a British panel of consulting engineers (see *Electrical Review*, 13th July, 1951). In recommending the adoption of the Kariba scheme this gave similar sizes for plant, costs per kWh, costs of the various works and general technical data.

V.H.F. Transmitter

THE British Broadcasting Corporation announces that the first of its new v.h.f. transmitting stations, using frequency modulation, will be brought into service at Wrotham, Kent, on 2nd May next. The purpose of this and other v.h.f. transmitting stations now being built by the B.B.C. is to reinforce the coverage of the existing medium-wave and long-wave services, reception of which is becoming difficult for many listeners because of the increasing interference from foreign stations and from electrical appliances of various kinds.

The new station will transmit the Light Programme on a frequency of 89·1 Mc/s, the Third Programme on 91·3 Mc/s, and the Home Service on 93·5 Mc/s. The effective radiated power will be 120 kW in each case, and the transmissions will be horizontally polarized. The station will serve the London area and South-East England within a range of about fifty miles.

The B.B.C. built Wrotham in 1950 as an experimental station with two transmitters to enable the problems of high power v.h.f. transmissions and their reception to be studied. A third transmitter is now to be added in readiness for the start of the regular programme service, and the present experimental transmissions from Wrotham will cease from 5th March to 7th April while installation work connected with the additional transmitter is in progress. To assist the radio industry and trade in the London area during this period there will be low-power test transmissions on 93·8 Mc/s from an experimental v.h.f. frequency modulation transmitter at Alexandra Palace.

The third transmitter at Wrotham, which will carry the Home Service, differs from the two already installed in that it is built as two separate units for operation in parallel, with each unit capable of maintaining the service at reduced power in the event of a fault on the other.

MAGNETIC MEASUREMENTS

Discussion at Institution of Electrical Engineers

DR. L. G. A. SIMS (University, Southampton) opened the discussion on the papers entitled " Iron Losses at High Magnetic Flux Densities in Electrical Sheet Steels " (by Professor Brailsford and Dr. Bradshaw) and " An Improved Precision Permeameter " (by Dr. Mee and Dr. Street) at a meeting of the I.E.E. Measurements Section on 1st March (see *Electrical Review*, 4th March, p. 340).

Dr. Sims described the work on iron losses as most excellent and ingenious. He thought it would be agreed by representatives of large steel manufacturing concerns that hitherto, and possibly still at the present time, information was not available about the specific heat or the heating capacity of packs of magnetic laminations; there were cases where this quantity could be really important. The authors had pointed out that the difficulty could be overcome with their experiment. It would be interesting to know with what degree of accuracy the authors' experiment could be repeated.

Mr. R. G. Martindale (Metropolitan-Vickers) stressed the value to the machine designer of the paper on iron losses; it was the first time they had been measured at densities of the order of 23,000 or 24,000 gauss. He thought, with regard to the permeameter, that the arrangement of having two Permalloy rods was a good one. They were wound in series opposition so that the least fundamental component in secondary winding was practically eliminated. The comparative curves obtained by different methods were what interested him most. It would be interesting to know what would happen to the measured value of H if the detector were moved over the surface where the grain size was very large and the detector not so large. In grain-oriented material not all the grains were in alignment and a large difference might well be obtained. This might raise a question as to the validity of methods of testing.

Professor J. T. MacGregor Morris (formerly of Queen Mary College) said that methods for determining losses in sheets ranged from whole sheets down to crystals. The paper on iron losses was an intermediate paper. When one looked at a magnified image of a polished surface of a sheet, one realized what an extraordinary conglomeration of material it was. There were crystals, some in one plane, some at right angles, and inclusions between the crystals. The results must necessarily be a kind of average.

Mr. C. E. Webb (National Physical Laboratory) said it was always a matter of great difficulty to improve the measurement of low H values in the yoke permeameter and the need for improvement was becoming more urgent with the development of the higher permeability materials. The improved precision permeameter seemed to fill the gap. In regard to the paper on iron losses, the testing techniques were difficult to apply on a routine basis and the test itself was really a spot test of the material.

Mr. O. I. Butler (Sheffield University) said that people in general did not seem to be aware that at high flux densities in particular the form factor could be kept constant and the power loss be almost doubled. He thought it important if reliable tests were to be made that they should be done under definite conditions. There must be either sinusoidal flux or sinusoidal H. Then different tests would give the same results. With the method employed in the paper he feared quite different results would be obtained with different circuits. With regard to the use of a calorimeter, he had gone in for a thermal wattmeter and although there were errors in this instrument very good results could be obtained provided one knew why the errors arose.

Mr. E. Rawlinson (Metropolitan-Vickers) said that he used a permeameter of the Armour, King and Walley type extensively. One great time waster was the establishment of uniform flux. Direct indication of lack of compensation was an admirable feature.

Mr. D. A. Langford asked whether the temperature distribution after 4 sec was virtually flat or approached parabolic form. If it was nearing parabolic condition, there might be considerable error in the absolute value.

The authors briefly replied.

Rural Electrification Conference

MORE than 120 representatives of Electricity Boards from England, Scotland, Wales, the Isle of Man and Guernsey are to attend a residential conference on rural electrification organized by the British Electrical Development Association. The conference will be held at the University of Nottingham's School of Agriculture, Sutton Bonington, from 28th to 30th March. With the greatly accelerated rate of rural electrification, the need has arisen for more staff capable of understanding and dealing with rural problems. At this conference, the men who have to deal with electrical development on the farm, and in the houses of those living in the area, will receive oral instruction from recognized experts in various spheres, and also have facilities for group study and discussions on the talks and demonstrations.

Under the chairmanship of Mr. C. R. King (chairman, East Midlands Electricity Board and vice-chairman of E.D.A.), the delegates on the morning of the first day will hear a talk on " Farmers—Their Policy," by Dr. J. D. Ivins (Sutton Bonington School of Agriculture). This will be followed by a talk on " Farmers—Their Electricity Service," by Mr. C. A. Cameron Brown (agricultural electrification adviser, B.E.A.). In the afternoon the chairman will be Mr. V. W. Dale (director and secretary, E.D.A.), when Mr. W. J. Guscott (assistant chief commercial officer, South Western Electricity Board), will speak on " Load Building in the Rural Areas." The delegates will then be taken on a conducted tour of the University farm and dairy science block.

The chairman for the morning of the second day will be Mr. W. Gilchrist (chief commercial officer, Merseyside and North Wales Electricity Board), when Mr. R. Scott (head of the dairy section, School of Agriculture) will speak on " Trends in Milk Cooling Practice," followed by Mr. P. Wakeford (B.E.A.), on " Chemicals and Steam for Sterilizing." In the afternoon, the chairman will be Mr. H. J. Gibson (chief commercial officer, Midlands' Electricity Board). Mr. R. M. Gravett (commercial officer, No. 3 Sub-Area, Merseyside and North Wales Electricity Board) will speak on " Farm Electrification in Cheshire," after which Mr. A. W. Gray (agricultural advisory section, B.E.A.), will speak on " Electricity in Commercial Horticulture."

On the last day, under the chairmanship of Mr. J. I. Bernard (chief technical officer, E.D.A.), Mr. W. R. Flintoff (Southern Electricity Board) will speak on " Farm Wiring Installations," followed by Mr. R. A. Bayetto (rural electrification officer, E.D.A.), on " The Publicity Needs of Rural Electrification."

WORLD ELECTRICAL MARKETS

Large-Scale Development in Turkey

By MICHAEL RICHARDS (Istanbul)

THE Turkish Government has recently approved a six-year plan to increase the output of electric power and expand its distribution. The programme involves a total expenditure of £111·6 million of which 60 per cent will be spent abroad for generating plant, transformers, transmission equipment, and many other products of the electrical industries. There is indeed a pressing demand for more and cheaper electricity in Turkey to-day. The country's present regime is committed to a series of very ambitious industrial development schemes which cannot, however, be realized until adequate power is provided. But even to-day's demand is not being met by the odd 55 kWh per head of the population now being produced.

There are various important industrial districts in the country, and among them the big port of Izmir (Smyrna), as well as the textile centre at Adana, where factories are to-day suffering power cuts during peak hours, and few Anatolian towns can boast of a round-the-clock electricity service for lighting purposes. Besides, the rates of almost 6d and 7d/kWh for industrial and other supplies, respectively, are in many cases commercially prohibitive.

With the exception of the power stations serving Ankara, Istanbul, and the Karabük and Zonguldak mining districts on the Black Sea the country's generating plants are generally of small capacity scarcely able to satisfy the local requirements. Most of them are run on expensive fuels while Turkey does not possess high quality coal in abundance and must import practically all of her oil supplies against payment in hard currency.

With several fast-flowing rivers in the country hydro-electric power production appears to be the way out. While so far only 5·5 per cent of the total electricity output has been accounted for by hydro-electric plants it is now the intention to start harnessing the country's water powers for generating purposes on a big scale. Some of these schemes are already under way and others have been decided upon.*

On the other hand, the Turkish authorities are also bent on replacing many of the old and inefficient thermal power stations by up-to-date steam plants. These will have higher capacities and serve larger areas, while using cheaper fuels of small calorific value of which there exists an abundance in many parts of the country. This refers especially to those districts which cannot be tied into a national grid.

* See "Hydro-Electric Development in Turkey," *Electrical Review*, 31st December, 1954.

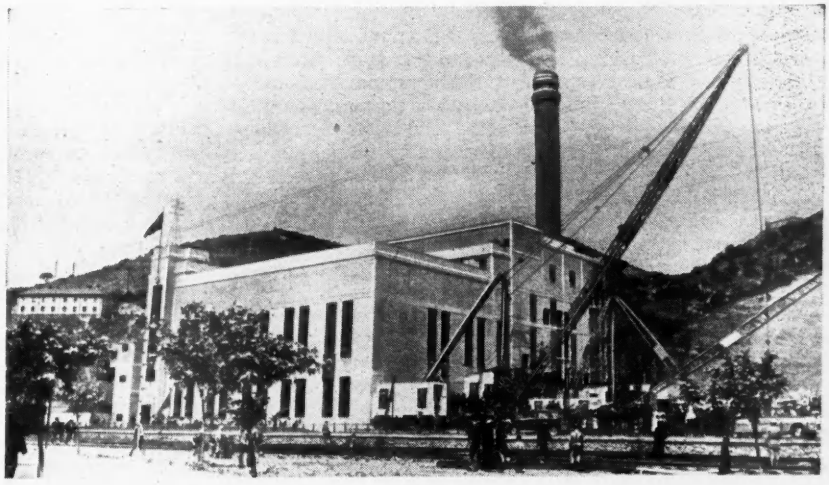
Altogether, referring to hydro-electric as well as thermal plants, the following projects have recently been awarded, and some of them are already under construction:—A total length of 1,682 miles of transmission lines for 154, 66 and 33 kV, with the necessary transformer stations, and 20 large as well as 58 smaller power stations with a total capacity of 570,880 kW. When the first stage of the new electric power expansion programme has been realized in a few years' time the total capacity of the country's generating plants will have increased by 150 per cent.

An excellent example showing the urgency of electric power expansion in Turkey may be drawn from the Seyhan hydro-electric scheme. When the work was started in 1952 there existed in the area for which the scheme was designed a demand for 20,000 kW and for 50 million kWh annually. Research during the spring of last year established that in the meantime these figures had increased to 40,000 kW and 160 million kWh.

Railway Electrification Planned

Intimately linked up with the programme of increased electric power output is the Government's intention to proceed with the electrification of the Turkish railways. Diesel engine trains, with most of the locomotives imported from Germany, are already replacing steam trains on many local lines, but complete electrification is the ultimate object. It is to start with the country's main line from Istanbul to Ankara and on to the Zonguldak mining district on the Black Sea, a total distance of 600 miles. Here again foreign producers of electrical railway equipment will stand good chances.

This applies equally to the envisaged electrification of Turkish mines. Turkish mining, though it has already yielded great benefits to the country, especially in regard to chrome—Turkey taking second place in world production after Soviet Russia—is still in its infancy. There is great scope in the location and exploitation of all available resources, and the already established mines so far make



The 60 MW Catalagzi steam station the capacity of which is being doubled with Metropolitan-Vickers plant

Excavations on the site of the Seyhan River dam which will be earthfilled and 57 metres high, impounding 1,400 million cubic metres of water

little use of modern electrical equipment. Cheaper and more abundant electric power is bound to have a very beneficial effect in this field and open up an important new market for British electrical mining equipment and installations.

Turkey has great resources of ores of poor quality which cannot be exported at a profit. With additional and cheaper electric power available, and the possibility of importing the necessary plant from abroad, Turkey could do her own smelting and largely increase the value of her exports.

Abundant raw materials being available in the country Turkey could also engage in the production of electrolytic copper, ferro-chrome, sulphuric acid, carbides, etc. This, too, would produce added export opportunities for British electrical manufacturers.

Component Market to be Encouraged

The Government authorities are now encouraging the development of an electrical industry in Turkey to manufacture such items as cables, switchgear, insulators, small and medium capacity transformers, plugs, etc., products which will come increasingly into demand with a higher electricity output and the foundation of new industries dependent on electricity for their power.

Such an industry is practically non-existent to-day. There is a single factory, the " Makina ve Kimya Endustri Kurumu," or Machinery and Chemical Industries Organization, which, with Government capital, is producing a few small electric motors commercially at Ankara; and there is the firm of Alfonso Torres, at Istanbul, which is making some rubber insulated wires and plastic insulators, and is engaged in the repair of electrical machines of up to 10 kW. Then there is finally Koç, Ltd., at Ankara, which produces lamps. Outside these three firms, and the odd man who makes small electrical apparatus for special purposes at high and commercially unwarranted costs, there is no electrical manufacture at all in Turkey to-day.

There is therefore not only a demand for this kind of industry, but it would unquestionably pay the country to set one up; the more so as foreign currency for the import of goods is in short supply. Fully aware that such an industry cannot be built up in Turkey without very active help from abroad, in regard to capital as well as technical experience, the authorities are at present engaged in doing everything they can to attract foreign participation and the new Foreign Capital Investment Law certainly goes a long way towards that end.

This was passed by the Grand National Assembly on 18th January, 1954, as Law No. 6,224, and was published in the *Official Gazette* No. 8,614. Foreign investors participating in Turkish industries by means of:—(a) " Capital in the form of foreign exchange "; (b) " Machinery, equipment, instruments, and the like . . . . . "; or (c) " Intangible rights, such as licences, patents, trade marks," are guaranteed by this law the transfer into the currency of the country whence the above-mentioned means originate the following profits and capital " at prevailing rates of exchange ":—(1) " Of the profits realized . . . . . such net amounts as accrue to the owners of invested foreign capital . . . . . "; (2) " The share of the owners of the foreign capital investment resulting from the proceeds of the sale of the assets at a reasonable price in partial or total liquidation of an enterprise . . . . . "; and (3) " The proceeds of the sale, at a reasonable price, of all or part of the foreign capital investment . . . . . "

It must be stressed that the Government has so far conscientiously honoured this law. When, on 19th October, 1954, a decree blocked all assets held in Turkey by non-residents the Government expressly exempted from " freezing " all profit and capital which, in accordance with the Foreign Capital Investment Law, are transferable into other currencies.

Foreigners interested in investing capital or capital goods in Turkey to participate in industries will, however, have to cope with certain difficulties. Before binding themselves they must obtain from the Government authorities firm undertakings:—(1) That they will be allowed to bring into the country, and employ there, all the foreign specialists and foremen they stand in need of, for they will experience great difficulties in finding such manpower within the country; (2) That they will be guaranteed at all times the necessary import licences for raw materials and products they require and that these licences will be issued without the undue delay so common in Turkey to-day owing to the incredible amount of red tape; and (3) That investing firms will be exempt from the prohibitive turnover tax.

This last item requires an explanation. Turkey's present system of taxation is unbalanced. As the farmers and peasants, who form 80 per cent of the entire population, pay no income tax whatsoever, the urban population, that is, trade and industry, have to provide practically all of the required revenues from taxes.

Besides sheets and insulating paper, copper is the principal item a Turkish electrical industry would have to import. Though Turkey produces copper, it is impure and cannot be made use of for most electrical purposes. When import duty and a special turnover tax are added to foreign copper the price becomes prohibitive; this is one important reason why no Turkish electrical industry has so far come into being.

Experts believe that under present conditions it is better to restrict any form of electrical industry to such items as the production of spare parts and components; repair shops,

too, would stand great chances, for there are no maintenance facilities for machinery, cars, aircraft, etc., whatsoever in Turkey to-day. In this line British capital and experience would indeed be able to profit, particularly as the British electrical industry has so far had a good share in supplying goods to Turkey.

The chief competitors in the Turkish market are Germany, the United Kingdom, France, the United States, and Switzerland, in that order. During the four years from 1950 to 1953 inclusive Turkish imports of electrical machinery and equipment were as follows: —

Year	Quantity (Tons)	Value (£000 Sterling)	Percentage of Total Imports
1950	3,021	2,069	2·0
1951	4,332	2,692	1·9
1952	7,939	3,500	1·7
1953	6,712	3,820	2·0

No foreign firm should endeavour to enter the Turkish market on its own. Whether the object is small or large, whether it concerns the sale of switchgear and lamps, or competition for the order for an entire generating plant, it will practically always be necessary to operate through a local firm, acting either as a distributing agent or as a representative for Government contracts. A foreign firm can seldom achieve its own marketing in Turkey or obtain big contracts from the Government without local intermediaries who know the difficulties of the market and maintain the necessary contacts in the various Government departments. There are first class firms of this kind in Turkey, some of them, as the Burla Biraderler in Istanbul and Koç, Ltd., in Ankara, with large modern showrooms and good contacts throughout the country, or the Alfonso Torres firm, Istanbul, with excellent electrical repair shops, as well as A.B. Tubini.

The most important object for the British electrical industry is, of course, participation in the contruction of entire power plants and transmission grids; and in this direction Great Britain has by no means been unsuccessful, though she has met keen competition from France and Germany.

By far the largest scheme now under way is the Sariyar dam and hydro-electric power plant with extensive transmission lines and large transformers estimated to cost £26·5 million sterling. It is being carried out by three German firms in collaboration with the sponsoring ETI Bank of Turkey. Germans are also in charge of the construction of thermal power plants. The A.E.G. is setting up the Tunçbilek plant, with two 32 MW turbo sets, worth £3·5 million.

The Gediz-Demirköprü dam and power plant near Izmir (total cost estimated at £12·3 million) are in the hands of a French firm in collaboration with the Turkish RAR group, the French being responsible for the provision of 60 per cent of the capital required. This combination is also in charge of the Akçay Kemer plant in the same region, costing roughly £9 million.

The English Electric Co. and George Wimpey & Co. are undertaking the construction of the Hirfanli dam and power plant in Central Anatolia, costing roughly £11·5 million; and Metropolitan-Vickers are handling another big job, the doubling of the Catalazgi thermal power plant involving a total outlay of £4·6 million.

The Americans are not direct participants so far, but have facilitated credits. The Seyhan River dam and power plant has its foreign currency requirements financed through a loan from the International Bank for Reconstruction and Development.

Foreign currency outlay is the weak point of the whole plan for increased electric power output in Turkey, for Turkey does not possess the means, though potentially a rich country, to pay, cash down, for what is required from abroad to realize the envisaged schemes. An over-ambitious and somewhat unco-ordinated industrial development scheme pushed ahead at great speed by the present regime, for political reasons, has caused a large deficit in the country's trade balance and has run up a large commercial debt. An exceptionally bad harvest last year has added to the financial burdens of the country: after having secured in 1953 fourth place among the wheat exporting countries of the world Turkey has now been forced to import some 300,000 tons of wheat. On the other hand, the country is rich in its subsoil; for instance, as already mentioned, she is the second largest chrome producer, to mention but one item.

There is hardly a question that, once her present economic difficulties have been overcome, and the industrial and electric power schemes have been carried out, Turkey will become a paying concern. Much depends, of course, on her preparedness to accept foreign counsel regarding economic and financial affairs; and this is one of the major items foreign investors will have to stress when dealing with her.

The Turkish authorities are to-day determined to press on with their schemes for the expansion of electric power and they are fully justified in doing so. It will pay dividends and it is in the interest of foreign creditors to help.

Now that Germany seems about to lose the advantage derived from being exempt from contributing towards Western defence British industry stands a better chance of competition and this chance should not be lost. So far, it has been difficult to meet German terms of credit and delivery, but now equality is likely to be restored and it is up to British industry to make the best of it.

HIGH FREQUENCY RADIO

THE discussion on the papers by Mr. E. N. Bramley, Dr. W. C. Bain and Mr. K. C. Bowen at the Radio Section of the I.E.E. (see *Electrical Review*, 4th March, page 340) was opened by Mr. W. Ross. He said that if a direction finder could be made which was more immune to the effects of site error it would not only remove errors which to some extent could be calibrated for, but also possibly reduce bearing fluctuations.

Mr. J. F. Hatch (Marconi's Wireless Telegraph Co.) referred to the question of time averaging and said that on some recent measurements a time interval of 0·72 sec was used between adjacent readings. The reduction of variance was found to be fairly constant for stations whose distance from the receiver varied between a few hundred and several thousand kilometres.

Dr. R. L. Smith-Rose (D.S.I.R.) made some interesting comparisons between the present papers and a paper written in 1920 outlining the author's experience in developing direction finders during the first world war. One graph in the earlier paper on bearing fluctuations occurring due to changes in the ionosphere might well have taken the place of an illustration in Mr. Bramley's paper. The bearings varied over two or three degrees in a matter of minutes. At the same time the Adcock direction finder was in substantially the form in which Mr. Bowen had it in use when it was patented in 1915.

Mr. D. W. G. Byatt (Marconi's) said that in dealing with possible improvements in operational high frequency direction finding, the two main sources of error to be tackled seemed to be those due to wave interference and observation. Automatic indication of bearing, although difficult to make comprehensive for the numerous types of transmission in the high frequency bands, should go a long way to solve the operational problem. Combining that with some form of time-averaging would help the removal of much of the error due to wave interference.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Railway Traction Systems

THERE has been quite a lot of talk about the proposed electrification of British Railways, but it seems to me that in the recent extensions that have been done and some of the discussions which have taken place, the most essential point has been missed.

Surely, as practically the whole of Southern England is covered by the Southern Electric system, other locomotives should be able to run on this system? We could still use an 11 kV overhead system, supplied at 50 c/s, with rectifying equipment in the locomotives themselves, and if the motors were wound for the same voltage as for the Southern Electric system, they could be supplied direct when running on the third rail system.

A scheme such as this would have great advantages where low tunnels were concerned, as the installation of a sub-station at a tunnel, and a length of third rail, would save many hundreds of thousands of pounds of civil engineering work. Some simple automatic device would be necessary to make sure the pantograph was lowered as soon as the locomotive made contact with the third rail.

St. Helier, Jersey. W. K. ALLEN,
Managing Director,
Jersey Electricity Co., Ltd.

Antistatic Rubber for Medical Use

WITH reference to the letter from Mr. Bulgin on the above subject in the *Electrical Review*, dated 18th February, I agree that the British Standard quotes a maximum resistance figure of 10 megohms. My company, however, does not manufacture antistatic products, but purchases them to fit to medical equipment.

It is of no use the rubber manufacturers sending us goods which already have the maximum resistance reading as it has been found that resistance increases with storage. The manufacturer should not be allowed to work to the 10 megohm figure, otherwise there is little chance of our final product having test figures within the prescribed limits.

Walton-on-Thames. E. O. MULLER,
Electrical Engineer,
Amalgamated Dental Engineering Industries, Ltd.

Street Lighting in 1885

IT is very interesting to those of us who have seen something of the early developments in our industry, to read the extract from the *Electrical Review* of 21st February, 1885, in the issue of 25th February.

I cannot go so far back as that date but in 1906 I went to Stratford-on-Avon to lay the original electric supply down for that town and I remember that about 1908 or 1909 the Nernst lamp came into use in this country. I believe real progress was made in quite a number of towns over here by the use of these lamps. I remember meeting Dr. Nernst in London about that time and I used many of these lamps in Stratford-on-Avon.

In my view, we had our first advances in lighting by electricity at this date and I am wondering whether the tantalum lamp with its efficiency of about 1·25 W per candle power preceded the squirted filament lamp with a slightly higher efficiency, or *vice versa*. The tantalum lamp ran on a 220 V supply, but the squirted filament lamp had to run in series.

Nevertheless, the increased efficiency from the carbon lamp having 4 W per candle power was so great that most people using electricity then were quite content to have these and put in an adaptor and burn two lamps instead of one.

It is quite possible that records of your journal will confirm these recollections and the dates of their occurrences.

London, E.C.2. C. D. FALCKE.

Hereford Electricity Supply

READING this week's issue of the *Electrical Review*, page 361—"£25,000 Change-over Completed"—I was very surprised to see it stated that the first a.c. supply was brought to Hereford in 1934 by 66 kV line from Stourport.

I was on the staff of the City of Hereford electricity undertaking on and off from 1916 to 1926, and not only were a.c. turbo-alternators and rotary convertors installed in 1916, but, about 1920, a.c. supply was exported to as far as Lydney by 11 kV line, as well as to a large rural area and parts of the city area.

Battle, Sussex. G. C. B. EVERARD.

Electromagnetically Enriched Isotopes

A CONFERENCE on the production and utilization of electromagnetically enriched isotopes will be held at the Atomic Energy Research Establishment, Harwell, from 13th to 16th September inclusive. Several leading members of the team responsible for the work on stable isotopes at Oak Ridge, U.S.A., will attend and provisional acceptances have also been received from leaders of the separator groups in France, Holland and Denmark. Although a detailed programme has not yet been prepared, sessions will be included on: Design and operation of large mass separators; ion source and collector problems especially with high beam current; separation of radioactive materials; chemical aspects of the production work; preparation of isotopic targets; developments in stable isotopes mass-analysis; and utilization of electromagnetically enriched isotopes.

Much of the meeting will be occupied with problems of the electromagnetic separator itself but contributions will also be welcomed on applications of stable isotopes, especially those of an unusual type. Those wishing to attend should write immediately to Dr. M. L. Smith, A.E.R.E., Harwell, Didcot, Berks, indicating also if they will make a written contribution. Abstracts of papers must be submitted before 30th April, and complete manuscripts before 30th June, so that preprints of the paper can be made available before the conference. Accommodation can be arranged locally and, apart from the cost of this, there will be only a small charge to cover food and transport for the four days. Fuller details of the arrangements will be sent to those who respond to this preliminary notice.

VIEWS on the NEWS

By REFLECTOR

BY the terms of the 1947 Electricity Act the British Electricity Authority is precluded from manufacturing electrical plant or fittings for export. That does not mean that the Authority is completely debarred from export business. If the cross-Channel power link comes into being it will be both exporter and importer of power, but more immediately it is now engaged in a quite different branch of the export business. Shipments of pulverized fuel ash from its Littlebrook power stations are now going to Aden where the material is being used for the new harbour works there in partial replacement of cement in the concrete works. The initial contract is for 1,450 tons of ash and it is expected that it will lead to orders from other parts of the world. Of course the ash is already in use in this country; the B.E.A. recently arranged an exhibition showing the ways in which it is being employed. This is a remunerative solution of an embarrassing problem —in fact something for less than nothing.

* * *

Introducing the new E.D.A. film "Planned for the Purpose" last week Mr. Victor Dale, director and secretary of the British Electrical Development Association, remarked, incidentally, that over three million British housewives now used electric cookers. Many more would have been using them but for the war because of the undoubted superiority of electric cookers over those of others whom he would not specify. This, he said, was a controversial matter, as was the question whether to use electricity or oil for street lighting.

* * *

Some notes on an exhibit at next week's Electrical Engineers' Exhibition inform me of a method of studying the habits of cattle to tell farmers which of their animals are placid and which are restless "thus enabling them to breed from the quieter and less muscular stock." In trials bullocks have been fitted with a harness incorporating micro-switches which are operated by the animals' movements and it is said that

> "the switches and recording gear tell the farmer how many times a grazing bullock stretches its neck to chew the grass, how many times it gets up and lies down—and even how many times it twitches its tail."

What with electric fences, electrical grooming, and (for cows) electrical milking the cattle world must be quite electrically-minded by this time.

* * *

Can it yet be said that the people of this country are really "light conscious"? Too many homes have too few lighting points and even these are fitted with lamps of too low a wattage. Many public buildings (apart from hotel bedrooms) are most inadequately lighted and, of course, the state of lighting of thousands of miles of streets and roads is notorious. Public lighting authorities often spoil a good installation by indulging in the false economy of small lamps; the amount saved is usually a ridiculously small proportion of the total cost. An amusing sidelight on this sort of thing is reported by the *Daily Telegraph*. A residents' association in Iver, Bucks, has for long been dissatisfied with the lighting of one of the thoroughfares of the district. The report says: —

> "The association already has one victory to its credit. Until last year the electric lights were only fitted with 40-watt bulbs. After some agitation the council gave way and bathed the area in the fierce glow of 60-watt bulbs."

It is said that the residents are still unsatisfied. Surely they haven't the temerity to ask that the 60 W lamps with their fierce glow shall be replaced by 100 W lamps with their blinding light?

* * *

Reporting a breakdown in the supply to the Henley-Claydon district of Suffolk, the *East Anglian Daily Times* said that a dead rook was found near a damaged line, suggesting that the bird, probably with others, had crashed into it. This inspired a correspondent (Mr. John Hadfield) to discuss the kind of rook concerned. He says that an ornithological friend suggests that it could not have been the common rook, *corvus frugilegus*, or even the hooded crow, *corvus cornix*, but a rare variant of the carrion crow called *corvis mendax*. He alleges that this uncommon visitor used to find the keen air of East Anglia uncongenial, but it may have been attracted in recent years by currents of hot air emanating from the Cliff Quay power station. "*Corvus mendax* bears a superficial resemblance to the jackdaw, and, like that bird can be taught to say almost anything." I pass this bit of bird-lore on to any maintenance man who may care to use it.

* * *

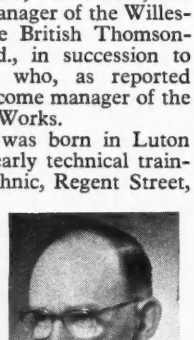
Electric heating was highly thought of as far back as sixty years ago when in its 8th March, 1895, issue, the *Electrical Review* described an installation at the Vaudeville Theatre, London. This consisted of six "box" radiators on either side of the theatre and twelve attached to the partition in front of the orchestra. Four radiators employed in preliminary experiments were retained as portable units for use as required. They were all of Crompton & Co.'s make and the wiring was in Henley's "cables of high insulation." It was reported that notwithstanding the draughts prevalent in any theatre (we still have them!) the temperature was maintained fairly constant. The consumption was said to be 9 units an hour and the cost, at 4d a unit, 3s an hour. But this was with two large radiators only operating. Presumably (and here the report is indefinite) the temperature was run up beforehand with the whole of the equipment in action. Even at that early date it was stressed that "one distinct advantage makes electric heating far preferable to other systems, and that is the perfect regulation."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. E. Alexander, A.M.I.E.E., has been appointed manager of the Willesden Works of the British Thomson-Houston Co., Ltd., in succession to Mr. H. E. Cox who, as reported previously, has become manager of the company's Rugby Works.

Mr. Alexander was born in Luton and received his early technical training at the Polytechnic, Regent Street, London. He joined the B.T.H. Co. as an electrical tester at Willesden in 1924, but in 1925 entered upon a student apprenticeship. In 1930 he returned to Willesden as experimental engineer, later becoming switchgear service engineer with added responsibilities as chief inspector. Mr. Alexander was appointed factory superintendent at Willesden in 1937, and general superintendent in 1946.



Mr. E. Alexander

Mr. C. F. Humphreys, Associate I.E.E., formerly engineering superintendent, has been appointed manager, Switchgear - Engineering Department of the B.T.H. Co., Willesden. Born in London, Mr. Humphreys received his early technical training at Regent Street Polytechnic. He joined the B.T.H. at Rugby as an engineering apprentice in 1920, transferring to Willesden Engineering Department in 1924. After service as a section leader on e.h.v. switchgear layout he was appointed layout engineer in 1936. Two years later he became deputy superintendent engineer and in 1946 assumed the responsibilities of superintendent engineer.

Mr. J. R. Mortlock, Ph.D.(London), B.Sc.(Eng.), M.I.E.E., is appointed manager, Power System Engineering Department, B.T.H., Willesden. Dr. Mortlock was born in Quetta, India, and educated at St. Joseph College, Nairi Tal. He commenced his technical education at Finsbury Technical College in 1921 and joined B.T.H. as a student apprentice in 1924. After completing his course he transferred to the Tender Engineering Department in 1928, but three years later was appointed assistant to the superintendent engineer. On the formation of the Power System Engineering Department Dr. Mortlock became its chief engineer, remaining in this position until his present appointment.

Mr. C. F. Humphreys *Dr. J. R. Mortlock*

Apart from other activities Dr. Mortlock has been a member of the Supply Section Committee, Institution of Electrical Engineers, since 1953. In 1946 he was awarded the I.E.E. Ayrton Premium.

The Minister of Fuel and Power has re-appointed **Mr. C. R. Heathcock,** F.C.I.S., Stourbridge, and **Mr. J. McDowall,** Sutton Coldfield, as part-time members of the Midlands Electricity Board.

Mr. D. S. Barwell, sales promotion manager (export) of Johnson & Phillips, Ltd., has left for a tour of Iran, Iraq, Kuwait, Syria, the Lebanon, Cyprus and Turkey.

Mr. Eric Gilham has been appointed sales manager to H. E. Kettle, Ltd., of Maidstone. **Mr. B. L. Taylor** succeeds Mr. Gilham as the company's industrial electrical representative.

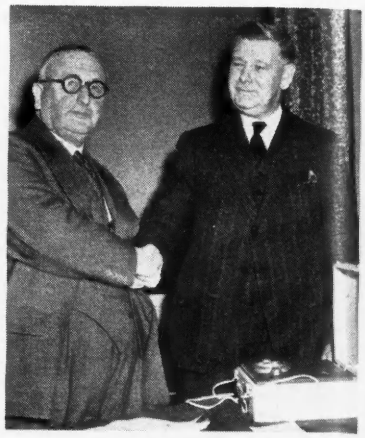
Mr. K. G. S. Croft has joined the board of L. E. S. Distributors, Ltd. He was formerly general manager of the company.

Dr. A. L. Cullen, B.Sc., A.M.I.E.E., has been designated Reader in Electrical Engineering in London University in respect of his post at University College.

Air Marshal Sir Victor Goddard, K.C.B., C.B.E., has joined Elliott Brothers (London), Ltd., as an assistant (air) to the managing director.

We regret that in reporting the appointment of **Mr. N. F. Marsh** as deputy chairman of the North Eastern Electricity Board in our last issue we said that Mr. Marsh was chief commercial officer of the Eastern Electricity Board whereas it should have been the East Midlands Board.

Mr. W. J. Dixon, M.B.E., chief of the Technical Cost Department, Automatic Telephone & Electric Co., Ltd., Liverpool, has retired after fifty-five years' service with the company. Since Mr. Dixon's first installation job in Glasgow in 1901, he has travelled extensively throughout the world in the course of his career. For the past thirty years he has specialized in contract pricing for supply agreements with the British Post Office and overseas telephone administrations.



Mr. W. J. Dixon (left) being congratulated by Mr. J. A. Mason, director and manager, Automatic Telephone & Electric Co., Ltd., at a presentation ceremony to mark Mr. Dixon's retirement

On 4th March the sixth annual reunion of the former **Electricity Commissioners** and members of their staff was held at the Bedford Head, Maiden Lane, W.C.1, fifty people attending. Among those present were Lord Hurcomb, Mr. C. G. Morley New, Mr. R. T. G. French, Mr. A. E. Marson and Mr. A. N. East.

The B.B.C. announces the appointment of **Mr. W. R. Fletcher,** B.Sc. (Eng.), A.M.I.E.E., as engineer-in-charge at the Brookmans Park transmitting station. Mr. Fletcher joined the B.B.C. in 1936 as an assistant maintenance engineer at the Lisnagarvey (Northern Ireland) transmitting station. He has served at a number of the Corporation's transmitting stations, and in 1944 became a senior maintenance engineer at the overseas transmitting station at Rampisham, Dorset. In 1949 Mr. Fletcher was seconded as chief engineer of the Ceylon Government Broadcasting Service, in which post he remained until 1951 when he was appointed resident engineer of the British Far Eastern Broadcasting Service at Singapore. Mr. Fletcher succeeds **Mr. D. Hamilton-Schaschke,** who has become resident engineer, British Far Eastern Broadcasting Service, Singapore.

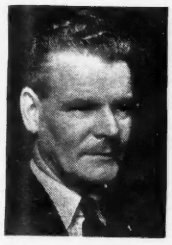
Mr. F. Bateman and **Mr. R. F. Marshall,** B.Sc.(Eng.), A.M.I.Mech.E., were recently appointed assistant managers, Education Department, of

the Metropolitan-Vickers Electrical Co., Ltd. Both are responsible to Mr. K. R. Evans, manager, Education Department, Mr. Bateman for trade apprentice recruitment and training, and Mr. Marshall for professional apprentice recruitment and training and military service matters.

Mr. Bateman went to Trafford Park as a probationary trade apprentice with the British Westinghouse Co., in 1918. On completion of his training he joined the staff of the Education Department in 1927, and since then he has been concerned with the training of trade apprentices. He became section leader, craft training, in 1946. In 1951 he was placed in charge of the new apprentice training school. For the past eight years Mr. Bateman has been a member of the governing body of the Flixton County Secondary School for Boys and Girls, and was chairman for the year 1950-51; he was recently elected as the first chairman of the governing body of the Urmston Wellacre Secondary School for Boys.

Mr. Marshall received his technical education at Cardiff Technical College and University and joined M-V as a college apprentice in 1936. In 1940 he joined the staff of the Education Department as technical assistant dealing with the professional engineering grades of apprentices and also with military service registration, and in 1951 he was appointed section leader, professional engineering training.

He is a member of the Stretford Committee for Education, the Further Education and Youth Advisory Sub-Committee (Stretford), and the governing body of Seymour Park Girls' School, Stretford.



Mr. F. Bateman

Mr. R. F. Marshall

Mr. D. R. Davies

Mr. D. R. Davies, M.I.E.E., Switchgear Engineering Department, Metropolitan-Vickers Electrical Co., Ltd., has been appointed consulting designer to the company. Mr. Davies joined the company (then British Westinghouse) as an apprentice in 1906. For many years he has been the chief metalclad switchgear designer at Trafford Park, and his numerous patents include several of outstanding importance, particularly in the field of high voltage switchgear for large power stations. During the last war he was engaged on the design of equipment for the services.

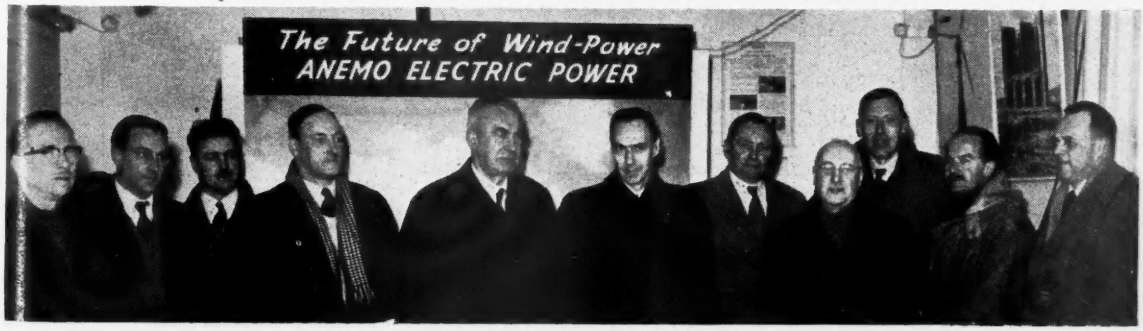
Mr. A. Rusck, chairman of the Swedish State Power Board, who has been on a visit to this country during which he gave a lecture to the Institution of Electrical Engineers on transmission developments in Sweden (reported in our last issue), recently paid a visit to the St. Albans wind power site of Enfield Cables, Ltd. He is seen in the accompanying picture with other visitors and executives of Enfield Cables, Ltd.

Mr. H. B. Campbell (generation engineer (construction), B.E.A.), and Mrs. Campbell, being received by Mr. H. E. Wright (chairman) and Mrs. Wright at the annual ladies' night of the Ipswich & District Electrical Association

Over 220 people from all parts of East Anglia, London and the Home Counties attended the annual ladies' night of the **Ipswich and District Electrical Association,** held at the Red Lion Hotel, Colchester, on 25th February. Mr. H. E. Wright (chairman of the Association) presided at the dinner with Mrs. Wright, and Mr. S. Hardy (vice-chairman) and Mrs. Hardy were also present. Following the dinner there was a dance.

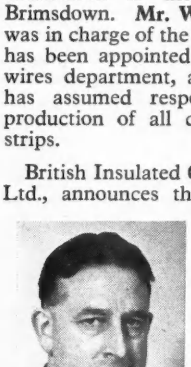
Mr. R. A. Kirby, A.I.R.I., has relinquished his position as works manager of the rubber and plastics cable factories of Enfield Cables, Ltd., in order to take up an appointment with the company's subsidiary company, Enfield Cables (Australia), Pty., Ltd. He will be sailing with his wife and children to Sydney on 5th April. **Mr. H. E. Tickner,** A.M.I.Prod.E., A.M.I.I.A., who was formerly in charge of the company's paper cable factory, has now been appointed works manager, cables, in charge of all three cable-making works. Mr. Tickner has completed 32 years' service with the company and has held office for six years as chairman of the Central Regional Council of the Association of Supervising Electrical Engineers. He is a director of Electrical Engineers (A.S.E.E.) Exhibition, Ltd. The Enfield Cables

Messrs. J. Flood (Troughton & Young); G. Gimpel (De Havilland Propellers); A. H. Stodhart (Electrical Research Association); E. W. Golding (Electrical Research Association); J. H. Peattie (British Electricity Authority); A. Rusck (president, Swedish State Power Board); M. J. Smith (Enfield Cables, Ltd.); Dr. A. Merriman (Institution of Metallurgists); S. Chaplin (Enfield Cables, Ltd.); H. Bliss (De Havilland Propellers); and Colonel J. W. Koletty (U.S. Embassy) during a visit to the St. Albans wind power site



subsidiary cotton covering factory at Blaenavon, Wales, has been closed down and this production has been transferred to the main works at Brimsdown. **Mr. W. G. Turner,** who was in charge of the Blaenavon factory, has been appointed manager, covered wires department, at Brimsdown and has assumed responsibility for the production of all covered wires and strips.

British Insulated Callender's Cables, Ltd., announces the appointment of **Mr. R. H. Steeds** as regional manager (Scotland). He will work from the Glasgow office. Mr. Steeds was educated at Bristol Cathedral School and the Merchant Venturers' Technical College, Bristol. He served his electrical engineering apprenticeship with Rouch & Penny, Bristol, and afterwards became traction sales engineer with Brecknell, Willis & Co., Ltd., Bristol. He was later appointed their traction sales manager for the North of England and Scotland. He joined B.I.C.C. in 1945 as sales engineer, Traction Department, and in 1952 was made assistant sales manager, traction, a position which he held until his present appointment.



Mr. R. H. Steeds

Mr. G. W. Garth, A.M.I.E.E., senior assistant engineer in the Generation (Operation) Department at Liverpool of the North West, Merseyside and North Wales Division, B.E.A., has been appointed deputy superintendent at Agecroft "B" station. From 1948 to 1952 Mr. Garth was system operation liaison engineer with the former Merseyside Division, and for two years previously was control engineer at Birmingham with the Central Electricity Board. He also served with the Bradford Corporation Electricity Department as switchboard attendant and control engineer.

The third annual dinner of the **Incorporated Plant Engineers** was held at the Park Lane Hotel, London, on 18th February, and was attended by about 160 members and guests. The guests included General Sir William Platt, a director of Mather & Platt, Ltd., Mr. H. Lyon, director of the Public Schools Appointments Bureau, the Earl of Verulam, Sir Leslie Hollinghurst, chairman of the National Industrial Fuel Efficiency Service, and Mr. F. M. Arkle, managing director, W. D. & H. O. Wills. The toast of "the Institution," was proposed by General Sir William Platt, and in his reply, the president, Mr. R. H. Cobbold, said that in his view the basic training that engineers received was such that it should make them particularly able to fill posts of higher management where technical knowledge and technical skill were not the primary requirements. In the last months there had been announced schemes involving the expenditure of £1,900 million. Engineers had to be prepared to cope with these schemes, and it was one of the primary functions of the Incorporated Plant Engineers to afford its members opportunities to improve their knowledge, to keep themselves up to date, and to learn about these new techniques. Mr. C. H. S. Howkins, a past president, proposed the toast of the guests and Mr. H. Lyon responded.

The South Eastern Area final of the **Electrical Industries National Golf Championship** will be held this year at Effingham Golf Club, Dorking, on Friday, 8th July next. Qualifying cards can be obtained from the area secretary, Mr. R. E. Prickett, B.I.C.C., Ltd., 59a, Middle Street, Brighton, 1. There will also be an open competition in the afternoon to which all members of the electrical industry are invited.

The area final of the Norfolk and Suffolk section will be held on 29th June at Thorpeness Golf Club, Suffolk. Any interested golfer in the electrical industry in this area who would like to participate should get in touch with Mr. D. C. Mason, Brayford, Harold Road, Frinton-on-Sea, Essex.

The annual presentation of sports trophies of the Social and Athletic Club of the **Telegraph Construction & Maintenance Co., Ltd.,** and **Submarine Cables, Ltd.,** was held in the works canteen at Greenwich on 1st March. The presentation was preceded by a variety concert by the Telcon Concert Party. Trophies, awards and long service certificates for fifteen and twenty-five years' service respectively were presented by Mr. J. N. Dean, chairman of both companies, and among those present were Messrs. W. F. Randall, B. H. Musgrave, J. Innes, C.B. (directors of Telcon), and Mr. G. T. W. Whitehead, general manager (works) of Johnson & Phillips, Ltd.

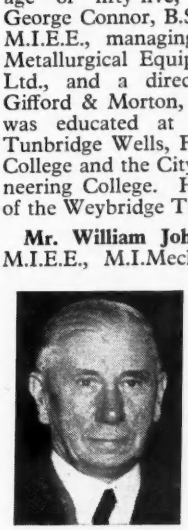
At last Tuesday's luncheon of the **Electrical Industries Club** Mr. A. B. Wildsmith, the chairman, reminded members that the next gathering (12th April) would be the annual general meeting. The speaker at the luncheon will be Mr. R. W. Moreton, a member of the British North Greenland Expedition.

OBITUARY

Mr. C. M. Mayson.—The death occurred on 1st March, at the age of eighty-two, of Mr. Christopher Mark Mayson, M.I.E.E. Mr. Mayson was born at Cockermouth, Cumberland, and was educated at St. Bees School. He received his training at the St. Rollox Locomotive Works of the Caledonian Railway Co., Glasgow, and at the Central Technical College of the City and Guilds, London. In 1895 he joined Whitehaven Borough Council Electric Lighting Department and was appointed electrician-in-charge in the following year. In 1899 he came to London to fill the newly created appointment of station engineer with the old Charing Cross, West End & City Electricity Supply Co. under Mr. W. H. Patchell, and remained in that appointment until he retired in 1937 upon the absorption of that company into Central London Electricity, Ltd. During the 1914-18 war he was additionally deputy chief engineer to the then newly appointed engineer-in-chief, Mr. W. B. Thorpe, and together they reorganized and modernized the undertaking. Mr. Mayson was president of the Diesel Engine Users' Association in 1929 and 1930. He leaves a widow and a son, Mr. C. F. Mayson, A.M.I.E.E., who is a barrister.

Mr. F. G. Connor.—*The Times* reports the death in Venezuela, at the age of fifty-five, of Mr. Francis George Connor, B.Sc.(Eng.), A.C.G.I., M.I.E.E., managing director of the Metallurgical Equipment Export Co., Ltd., and a director of Campbell, Gifford & Morton, Ltd. Mr. Connor was educated at Skinner's School, Tunbridge Wells, Finsbury Technical College and the City and Guilds Engineering College. He was a governor of the Weybridge Technical Institute.

Mr. William John Hanvey Wood, M.I.E.E., M.I.Mech.E., former joint general manager and a director of the County of London Electric Supply Co., Ltd., and from vesting day until his retirement last year, part-time member of the London Electricity Board, died on 2nd March at the age of seventy-six. Mr. Wood was born in Antwerp, Belgium, and received his training at the Phœnix Works and Cie Hydro-Electrique, Antwerp. In 1898 he joined Edinburgh Corporation as junior assistant engineer, and in 1900 went to Bolton where he became electrical engineer and manager in 1913. His association with the County of London Co. commenced in 1927 when he became engineer-in-chief, a position he held until his appointment as joint general manager. He was also a director of the Kent Electric Power Co. Mr. Wood held numerous appointments as chairman and member of statutory and other bodies during the thirty years before his retirement.



The late Mr. W. J. H. Wood

Mr. G. T. Perkins, technical sales manager, and **Mr. L. R. Langmead,** technical service manager, of Smiths Aircraft Instruments, Ltd., died in a road accident on 28th February. Mr. Perkins was born in 1909 and joined Smiths in 1927, becoming technical sales manager in 1948. Mr. Langmead joined S.A.I. less than a year ago and

had previously been senior liaison representative to the de Havilland enterprise in France. He was thirty-eight.

Mr. Alexander Sinclair, a director and general manager of the Craigpark Electric Cable Co., Ltd., Glasgow, died on 1st March after an emergency operation. Mr. Sinclair was sixty-one and had been with the company for over forty-four years, having served for many years as secretary before his election to the board in 1948.

Mr. Frederick Quaife, manager of the London Washing Machine and Vacuum Cleaner Department of the Hotpoint Electric Appliance Co., Ltd., died on 24th February. Mr. Quaife, who was fifty-five, joined Hotpoint in 1931, and served during the war with the Ministry of Supply (Fighting Vehicles Department), returning to the company in 1946.

WILLS

Mr. H. G. Tisdall, late of Crown Agents, who died on 13th March, 1954, left £14,070 gross (£13,876 net). Among his bequests is £100 to the Institution of Electrical Engineers' Benevolent Fund.

Mr. R. F. Bruce, a director of the Saxonia Electrical Wire Co., Ltd., who died on 23rd March, left £10,223 gross (£10,121 net).

Mr. A. E. Evans, formerly secretary of W. Canning & Co., Ltd., who died on 26th August last, left £219,528 gross (£217,267 net).

Mr. E. L. Montagnon, Ph.D., M.I.C.E. director of Ransomes & Rapier, Ltd., who died on 3rd September last, left £14,666 gross (£14,482 net).

Mr. H. G. Yates, senior designer for the Parsons and Marine Engineering Turbine Research and Development Association, Wallsend, formerly with the English Electric Co., Ltd., Rugby, who died on 15th September, left £10,953 gross (£7,063 net).

Mr. J. Wilkinson, founder and chairman of Wilkinson, Bentley & Co., electrical engineers and tool manufacturers, who died on 8th April last, left £3,697 gross (£3,498 net).

Mr. D. S. Cargill, London sales manager, Claude-General Neon Lights, who died on 6th August, left £2,584 gross (£2,534 net).

Mr. H. D. Lamerton, a partner in Smith & Lamerton, electrical contractors, Gloucester, who died on 4th May, left £8,104 gross (£7,121 net).

Mr. F. G. Thomson, sales manager of the Stearn Electric Co., Ltd., who died on 10th October last, left £1,041 gross (£927 net).

Mr. L. H. Lane, superintendent of the Fuse Department of Ferranti, Ltd., Manchester, who died on 6th October last, intestate, left £1,496 gross (£1,433 net).

Mr. J. B. Browning, a specialist oil-filled cable engineer, British Insulated Callender's Cables, Ltd., who died on 11th July, left £3,920 gross (£3,864 net).

Brighton Technical College Awards

The annual distribution of prizes, diplomas and trophies at the Brighton Technical College took place on 28th February, the presentations being made by Sir John Buchanan. Mrs. M. G. Mills, M.A., chairman of the College governors, presided, and among other notable persons present were Ald. and Mrs. A. H. Dilley (Mayor and Mayoress of Hove), Ald. and Councillor J. Hay (Deputy Mayor and Mayoress of Brighton), Mr. N. C. Stamford (Institution of Electrical Engineers) and Mr. H. Pryce-Jones, manager (Mid-Sussex), S.E.E.B.

Dr. G. E. Watts gave a comprehensive report of the year's work of the college, particularly with regard to the Mechanical and Electrical Engineering Departments. He said that the prizes were provided out of a joint departmental prize fund and included donations from the Institutions of Mechanical and Electrical Engineers (Southern Centres), South Eastern Electricity Board (which has promised two prizes annually for electricity engineering), A.E.U., E.T.U., Allen West & Co., Ltd., A.P.V. Co., Ltd., Automatic Telephone & Electric Co., Ltd., British Insulated Callender's Cables, Ltd., C.V.A. Jigs, Tools & Moulds, Ltd., and Metal Box Co., Ltd. The four-year scheme for the re-equipment of the electrical laboratories embarked upon in 1952 was proceeding according to schedule. The Automatic Telephone & Electric Co., Ltd., had presented to the College a single channel carrier telephone system of the latest design, and this equipment would shortly be installed in the telecommunications laboratory.

Smokeless London

The Common Council of the City of London last week decided to declare the city a smokeless zone as from 2nd October next under powers already obtained. This means that only smokeless fuels, electricity and gas will be permissible after that date.

While the subject was under discussion Capt. Alfred Instone expressed regret that the Corporation had no powers to deal with smoke from railway locomotives and electric power stations. He moved an amendment designed to secure an inquiry into the effects of smoke from Bankside power station. After it had been explained that the Council had been in touch with Bankside but opinion was not unanimous on the question of smoke washing, the amendment was defeated.

Power Convention Papers

Mr. W. F. Cartwright, D.L., J.P., M.I.Mech.E., assistant managing director, Steel Company of Wales, is to present a paper on "The Use of Electricity in the Steel Industry" at the British Electrical Power Convention, Brighton, on 30th June.

This will be one of a symposium of four papers on the subject of "Electricity and the Industrial Future." Mr. B. L. Metcalf, M.I.E.E., M.I.Mech.E., chief electrical and mechanical engineer of the National Coal Board, will deal with the use of electricity in the coal industry, Mr. G. Nonhebel, B.A., B.Sc., F.R.I.C., fuel technologist of the Fuel Economy Section of Imperial Chemical Industries, Ltd., with its use in the chemical industry, and Mr. Felix A. Rogers, M.B.E., British Electrical and Allied Manufacturers' Association, with its use in the catering industry.

Belgian Traction Conference

The Association des Ingénieurs sortis de l'Ecole de Liège, Belgium, is organizing an international conference on railway traction in Liège from 25th to 28th April, during the run of the International Fair in that city. It will be held under the presidency of Monsieur de Vos, director-general of the Belgian State Railways, and papers will be presented on various aspects of electric and diesel railway operation. The proceedings include an official dinner, a visit to the Fair and an excursion on the Belgian railways. Particulars are obtainable from the Sécretariat des Journées Internationales de la Traction dans les Chemins de Fer, 22, rue Forgeur, Liège.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM Ingots	ton £163 0s 0d
COPPER, H.C. Electro	ton £340 10s 0d
Fire Refined 99·70%	ton £338 0s 0d
Fire Refined 99·50%	ton £337 0s 0d
COPPER Tubes ..	lb 3s 3½d
Sheet	ton £405 15s 0d
H.C. wire and strip ..	ton £382 10s 0d
LEAD, English ..	ton £103 10s 0d
Foreign	ton £102 0s 0d
MERCURY	flask £109 10s 0d
TIN, block (English) ..	ton £708 10s 0d
ZINC, G.O.B. Foreign	ton £87 0s 0d
Electrolytic	ton £95 0s 0d
BRASS Tubes (solid drawn)	lb 2s 7d
Sheet	ton £319 0s 0d
Wire	lb 3s 2½d
PHOSPHOR BRONZE Wire	lb 4s 8⅝d
PLATINUM	oz £29 0s 0d
RUBBER, No. 1 R.S.S. spot	lb 25½d—25⅝d

INDUSTRY AND THE HOUSE

By A. M. F. PALMER, A.M.I.E.E., M.P.

WHEN the Leader of the House, Mr. Harry Crookshank, was asked if the Government would provide for a debate on the nuclear power White Paper, he referred the questioner to Mr. Ronald Bell's motion down for the following Friday, when, although few Members were present, a useful debate developed. The motion welcomed the possibilities of the benefits to be obtained from "the peaceful development of atomic energy." In a following phrase it referred to the "programme outlined by the Government for the development of electricity from nuclear power and to the use of radioactive isotopes in research, medicine, industry and agriculture."

Mr. Bell pointed out that as a result of the concentration of public attention upon military development we frequently underestimated the broader nuclear contribution of the United Kingdom. Had it not been decided to transfer the Department of Scientific and Industrial Research to Canada and the United States in 1943 in order to take it out of the range of German bombing, British work in nuclear science would not have become merged in the parallel development in the United States. Since 1946 Britain had been engaged in catching up the ground she had lost.

Over the next twenty years, Mr. Bell predicted, the country would be still building a certain number of coal-fired power stations, but after that all new generating construction would probably be of the nuclear variety. By 1975 a quarter of Britain's electricity supply would be based on nuclear power; in this way we should be saving about 40 million tons of coal annually. No other programme of comparable dimensions had been announced in the world. The Government were to be greatly congratulated on their "courage and imagination."

Industrial Uses of Isotopes

Mr. Bell devoted the end of his speech to discussing the use of radioactive isotopes in industry. He pointed out that the United Kingdom was now a big exporter of isotopes; they were sent to over forty or fifty different countries in all parts of the world. We had established a commanding position for them in international markets. It was important that British industry should also recognize how valuable isotopes were for economy and saving costs. They could be used also for testing, standardization and efficient marketing, and for solving problems of production and even of industrial chemistry which would be perplexing without them. The processes were extremely simple and as far as safety was concerned the amounts used were so minute that no element of risk was involved. British industry should take full advantage of the "fabulous wealth" in radioactive substances.

Mr. Bernard Braine, in seconding Mr. Bell's motion, dealt with two important points: the supply of engineers and technologists, and research. He said that to design and build nuclear power stations and factories would require engineers of the highest calibre. To analyse and separate, to purify the chemical compounds, to enrich uranium, to extract plutonium and to handle radioactive materials would call not just for more industrial chemists but men of exceptional qualities. Despite the increase in the output of technologists since the war, expanding production and the increasing use of scientific techniques in industry had caused demand to out-run supply. At root the future was jeopardized by the shortage of graduate science teachers in the schools; the seventh annual report of the Advisory Council on Scientific Policy had made some interesting recommendations on means of attracting them.

Mr. Braine contended that graduates should undertake more part-time work in industry. A stop must also be put to the present wastage of potential technical specialists among early school leavers. On research he made the old complaint that while the quality of our fundamental work was as good as that of the United States, we fell behind in applied research. An American economist had recently estimated that the United States benefited more from British fundamental research than Britain herself. He felt that there was a case for considering whether we ought not to devote more Government resources to applied research and to the dissemination of information than at present.

A number of Members on both sides of the House continued the debate until it was wound up just before half past three by the Minister of Works, Mr. Nigel Birch. In answer to points raised he referred, among other things, to the homogeneous type of nuclear reactor. He said that this was well-known; it was being developed and tests were being made. It might be that at some time this country would construct such reactors, but for the moment it was important "to keep our feet on the ground" and "feel the way." The programme in the White Paper was purely provisional; it was not fixed as were the laws of the Medes and Persians.

The Minister went on to refer to capital investment. It had been said that £300 million was both too little and too much. The fact was that Members had to agree that the country must have electricity and the programme provided for an alternative way of producing this energy; the capital cost was not, therefore, an addition, but to a great extent a substitution. In answer to Mr. Fred Willey, the Labour Member for Sunderland North and an ex-Parliamentary Secretary to the Ministry of Food, who had asked about the effect of the increased use of nuclear power on the demand for coal, Mr. Birch said that in the current year the demand for coal for generating electricity would be about 40 million tons. In 1975 there should be a reduction in the demand for coal, from what it would have been if we had had no nuclear power, of between 35 and 40 million tons. Without that reduction the estimated demand for coal would not be 40 million tons, but 100 million tons a year.

Board Members' Salaries

Mr. J. Grimond, one of the younger of the few Liberal Members in the House, had raised the matter of the salaries of members of boards of nationalized industries generally, following the report of the Advisory Committee on the Organization of the National Coal Board. Answering Mr. Grimond, Sir Winston Churchill, as Prime Minister, said that any increases could only be decided in relation "to a review of remuneration in other industries." This was a reference to the fact that the Committee had advocated that some members of the National Coal Board's staff should receive £7,500 per annum.

PARLIAMENTARY REPORT

DURING the debate on defence in the House of Commons last week Mr. Selwyn Lloyd, Minister of Supply, stated that the production of electronic equipment for the Forces in the year ended March, 1954, was five times as much as in the year ended March, 1950. This production included airborne radar, radio communications, navigation aids and ground equipment which was an essential part of any defence chain. This increase had been accompanied by larger exports by the electronic industry—£29,300,000 in 1954 as compared with £18,200,000 in 1950.

He said that completely new control and reporting equipment had been installed since 1952, giving big improvements in both performance and reliability, so that the United Kingdom control and reporting system was now the best in the world.

A new navigation and bombing system of very high performance had been developed and production had begun. Another aircraft navigation system, based on entirely new principles, had been developed and was in production. Electronic equipment was the essence of modern anti-submarine war. The British Sonobuoy system had been so successful that the United States had decided to authorize it as part of the system for use by the U.S. Forces. In the Army, a large development programme was involved in the conversion of all regimental radio communication to v.h.f. New ground radar equipment of greatly improved performance had been supplied to the Army and N.A.T.O. countries.

Lamp Makers' Arrangements

Mr. Selwyn Lloyd, replying to a question by Mr. G. H. Oliver, said that the Electric Lamp Manufacturers' Association had given the required undertaking that members who sold lamp components (other than patented components and ready-coiled filaments) would make them equally available to members and non-members at prices which should not be higher to non-members than to members. An assurance had been given that the controlled companies would continue to provide a measure of competition as suppliers of cheap lamps and that they would not be used as "fighting companies." The sales quota system had been brought to an end; the Association's rules about Type "B" lamps had been altered to remove quantity and quality restrictions; the arrangements for exclusive dealing had been brought to an end as also had payments to associations of distributors. E.L.M.A.'s revised rules no longer provided for the enforcement of resale price maintenance by means of the collective sanction of fines and the stop list; and the revised rules permitted all retailers to give deferred dividends on purchases.

On prices, the Monopolies Commission recommended that the continuance of the practice of fixing common manufacturers' prices should be subject to two conditions, namely: (a) that E.L.M.A. members should take steps to ensure that the system of exchange of technical knowledge extended to all manufacturers who were within the system of common prices; and (b) that the level of prices fixed by E.L.M.A. should be reasonable.

The Association had given an assurance that the necessary steps had been taken to meet the first condition. The Monopolies Commission concluded that the general level of prices charged by E.L.M.A. in 1950 was almost certainly moderate and the Association had justified the two subsequent increases on the grounds of increased production costs.

With regard to insulated electric wires and cables, Mr. Selwyn Lloyd referred the House to earlier replies that he had given. The detailed measures taken by the associations to bring their arrangements into conformity with the conclusions of the Commission's report were a domestic matter for the associations.

Price Maintenance Costs

Mr. Nally asked the Chancellor of the Exchequer what action he proposed to take to end the situation under which the total costs of private price-maintenance organizations, including legal fees and investigation costs, were being allowed to be charged as legitimate business expenses against both profits and income by the persons or groups concerned.

Mr. Butler replied that he saw no reason to depart in this field from the ordinary rules governing the admissibility of deductions in computing trading profits for tax purposes.

Lords Debate Railway Plan

It will be five years before the railway modernization and electrification plan gets fully under way, the Marquess of Salisbury, Lord President of the Council, informed the House of Lords when they discussed the Government's transport policy. After briefly describing the schemes, he said, "I do not want to mislead the House into thinking that all this can be done at once. The plan is so expensive that I gather it must take at least five years before it is fully under way. There are many reasons for this. In the case of the electrification schemes, the vast size of the engineering works required will involve a long period of engineering planning and preliminary work. And on the maintenance side, staff will have to be trained in the business of servicing diesel and electric locomotives which I am told are far more complicated and require a higher degree of specialization in the maintenance staff than the steam locomotive needs. Orders for this vast quantity of new equipment will also have to be placed with industry and the Commission's entire railway organization will have to be adapted to cope with the new developments."

Lord Lucas of Chilworth said the only benefit which could be expected from the new tube railway project for London, which would cost £50 million and would never be made to pay, would be an amelioration of traffic congestion in London. By taking revenue from the buses and putting the traffic underground it would put London Transport deeper "in the red."

Lord Falmouth praised the efficiency and availability of diesel-electric locomotives. Electrification was the ideal which everyone would like to see achieved, but in an undulating country like ours, where there were 60,000 under and over bridges, it would be extremely expensive. About half the bridges would have to be modified in order to make them available for the increased loading gauge required to take the pantograph of electric locomotives.

Lord Monkswell said that the cost of electric working was kept a dead secret. He hoped nothing would be done at least until Parliament had received full estimates and full information of the results up to date of electric working and these had been submitted to public scrutiny and discussion.

Lord Hurcomb, former chairman of the British Transport Commission, told how the plans for electrification were prepared long ago. The first step was to complete the electrification of the south-east region where, rightly or wrongly—and probably wrongly—it had been decided to use the third rail method. When the Commission was set up they thought it right to survey the technical aspects of electrification and to review the standardization of the voltages to be used. In that inquiry they had the assistance of the best expert outside the railways, the late Mr. Frank Lydall. This was a necessary preliminary to any decision on whether to electrify or not.

Replying to the debate, Lord Hawke, Lord-in-Waiting, did not comment on Lord Monkswell's request for comparative figures on steam and electric working, but he said that Lord Falmouth had put his finger on one of the most important aims in the modernization plan—the through-braking of all goods stock. This depended on a decision as to the type of brake and coupling to be used and this matter had not been settled yet.

Southall Technical College

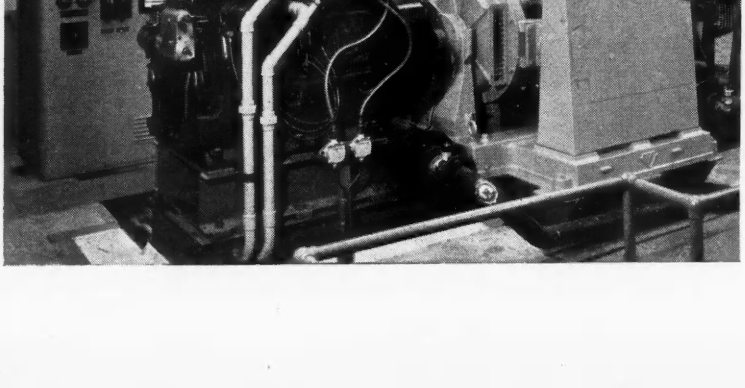
Engineering Extensions Opened

An increased demand for laboratory, drawing office and classroom accommodation has resulted in the building of considerable extensions, just opened, to the Middlesex County Council's Southall Technical College.

The opening was performed by Sir Claude Gibb, C.B.E., the theme of whose address was the necessity for technical and technological education in England at the present time. He stressed the fact, that while it might be claimed that England led the world in research in pure science, we lagged behind in the application of the fundamentals thus discovered. He called attention to the fact that an ideal set-up in an industrial engineering concern would consist of a very few highly qualified university graduates together with a large number of people holding Higher National Certificates or equivalent in appropriate subjects. A little lower down but still working with the same team, would be still more people with Ordinary National Certificates. He was particularly insistent in stating that after a few years in the industry it was impossible to differentiate between the university graduate and the person who had been brought up the hard way and obtained his professional qualification without attending at a university.

A new thermodynamics laboratory can carry out tests on steam, oil or petrol fired prime movers and the plant includes a 75 h.p. Parsons turbine, a 100 h.p. A.E.C. oil engine, a 20 h.p. compound steam engine, a 40 h.p. Lister oil engine, a 23 h.p. Robey oil engine, a 12 h.p. high compression gas engine, two petrol engines and a Heenan & Froude electric dynamometer test plant. Other laboratories are for materials and machines, machine tools, metrology, and elementary and advanced electrical engineering. An innovation is a servo-mechanisms laboratory used by advanced students and containing equipment for investigating the performance of d.c. and a.c. remote position-control and velocity-control systems.

Heenan & Froude electric dynamometer test plant in use with a 40 h.p. Lister oil engine

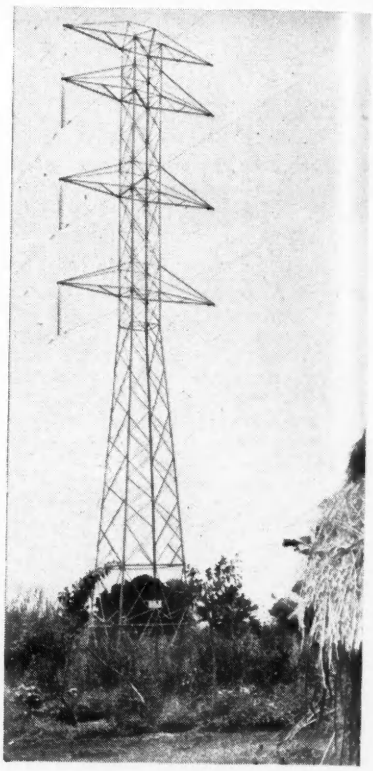


Brazilian Import Licences

Although no immediate change is anticipated, the Brazilian Government's intention to suspend at an early date the sale of exchange at auction is clearly revealed in an amendment to the prior licence law, which has been extended to 30th June, 1956.

The amendment authorizes the executive to suspend, wholly or in part, when it considers advisable, the sale at auction of exchange certificates, substituting payment for imports at free market rates, plus surcharges. The surcharges for category 1, 2, 3, 4 and 5 imports are fixed, respectively, at 35, 50, 65, 75 and 100 per cent of the mean bids for these classes at auctions held during the last three months. Applicants are entitled to import licences on payment of 50 per cent of the corresponding surcharges, the balance to be paid with the customs duties when clearing the merchandise.

A new system of export subsidies has also been introduced.



Above : A tower on the Owen Falls to Tororo section of the 132 kV overhead line

FIRST STAGE OF UGANDA'S GRID FINISHED

On 12th February Sir Charles Westlake, chairman of the Uganda Electricity Board, and members of the Board's staff visited the site of work near Jinja to see the final stages in the construction of the 132 kV transmission lines which have been built to carry power from Owen Falls to Kampala and Tororo.

The lines have a route length of 114 miles and are the first stage in the development of a grid transmission system for Uganda, and perhaps for the whole of East Africa. Although it is barely sixteen months since the first of the 552 steel towers was erected, the lines are now complete and are operating at 33 kV. They will go into commission at the full voltage of 132 kV later this year.

After seeing the last joints made in the conductors, Sir Charles inspected the River Nile crossing where, earlier in the course of construction, a rocket carrying a pilot line had been fired across the river to enable the 1,500ft span of conductors to be pulled over. He then went to the termination of the lines at Owen Falls where he met members of the staff of British Insulated Callender's Construction Co., Ltd., the contractors who built the lines, and discussed some of the problems encountered in the difficult bush and forest country.

Electrical Engineers' Exhibition

PREVIEW OF NEXT WEEK'S DISPLAYS AT EARLS COURT

OVER 230 electrical manufacturers, associations and other organizations are participating in this year's Electrical Engineers' (A.S.E.E.) Exhibition to be held at Earls Court, London, from Tuesday to Saturday next week. Compared with last year this represents an increase of sixty in the number of exhibitors and the floor space has been extended to an area of 250,000 sq ft. While the exhibits to be seen will cover a very wide field, ranging from generation and distribution equipment to the actual installation materials, cables and wires, lighting fittings of all types, instruments, industrial, commercial and domestic equipment, etc., the theme will be electric motors, with "Motor Way" containing many of the latest developments. Two awards will again be made to the manufacturers exhibiting the most outstanding 1955 domestic labour-saving and industrial devices. The exhibition is being officially opened at noon on Tuesday by Lord Citrine, P.C., K.B.E., Comp.I.E.E., Chairman, British Electricity Authority. It will be open, to the trade only, daily from 10 a.m. to 7 p.m. (Wednesday until 9 p.m.)

A. & M. Electrical Services, 54, Station Road, London, N.W.10.—**Stand 205.** — The company, as specialists in repairs, rewinds and conversions to a.c. and d.c. motors and generators ranging from fractional to 50 h.p. and all portable electric tools, exhibit armature and stator winders.

AC-Delco Division of General Motors, Ltd., Dunstable, Beds.—**Stand 94.**—A representative selection of f.h.p. motors is shown and the wide range of motors and parts is of equal interest to manufacturers of motorized equipment and appliances and those engaged on service of "Delco" motors in the field. Exhibits include capacitor-start motors suitable for refrigeration, air compressors, air and water pumps, stokers, waste disposal units, etc.; a universal f.h.p. motor for washing machines, dryers, catering equipment, blowers, etc.; rotor and stator units; universal a.c./d.c. motors for small household appliances; l.v. d.c. motors for automobile applications, car heaters, window raising equipment, electric cooling systems, etc.

Aerialite, Ltd., Castle Works, Stalybridge, Cheshire.—**Stand 147.**—This company is exhibiting a wide range of cables and flexibles for industrial, domestic and mining electrical installations. Also shown is the range of "Ashathene" cables with polythene core insulation and p.v.c. sheathing and the "Ashton" t.r.s., v.i.r. welding cables and flexibles. A display panel will show a typical section of an installation using armoured and unarmoured types of cable.

Agro Electrical Co., Ltd., 60-66, Wardour Street, London, W.1.— **Stand 90.**—A comprehensive range of bells, buzzers, bell transformers, bell indicators and bell pushes, including all types from ironclad weatherproof to domestic. A selection of Bakelite accessories includes lampholders, ceiling roses, junction boxes, line cord switches, suspension switches, door switches and adaptors.

Aidas Electric, Ltd., Sadia Works, Rowdell Road, Northolt.—**Stand 145.**—The winner of last year's domestic award, the "Sadia" 3 gal storage heater, is again on show, together with a number of storage type water heaters from 1½ to 30 gal capacity. Of special interest is the type "UTC" of 3 gal capacity designed for installation under bar counters or in milk bars, restaurants, etc. In the 40 to 60 gal range there is the 60 gal type KS water heater with 9 kW loading. A selection of immersion heaters is also exhibited.

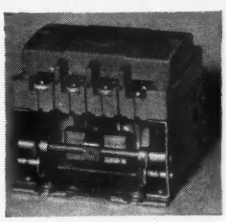
Allen West & Co., Ltd., Brighton, Sussex.—**Stand 186.**—Industrial and flameproof motor starters and control gear of both hand-operated and automatic contactor designs are shown, together with control accessories and special purpose switches; push-button switches; limit switches and float operated liquid level control switches; drum type controllers; liquid rotor starters; oil break l.v. and h.v. distribution switchgear up to 250 MVA and 11 kV; marine type control equipment; h.v. liquid type fuses, mercury switches and time switches. A new product is the type "PSC4D" contactor pattern direct-switching starter with plug-in interior unit.

Arrow Electric Switches, Ltd., Hanger Lane, London, W.5.—**Stand 117.**—There is a complete range of 3 A, 30 A (illustrated), 50 A and 100 A magnetic contactors incorporating new design features including a unique right-angle movement, two breaks per pole, easily removable contacts and a hood and base moulded in "Plascon-Alkyd," a new material for which a high surface resistivity is claimed. Also exhibited are a range of 10 h.p. direct-on-line magnetic starters incorporating the new contactors; enclosed push-button stations comprising 1, 2 and 3 button units; and a complete range of relays giving 30 different circuit arrangements on a standard moulded base. There is a large selection of appliance, rotary and tumbler switches, miniature toggle switches and a new extended trigger lever switch for use in portable electric tools, together with toggle and push-button switches for instrument work.

Ashley Accessories, Ltd., Ulverston, Lancs.—**Stand 142.**—Accessories for lighting and power installations include 13 A ring circuit accessories, socket and switch-socket outlets, fused plugs, fused adaptors, and selective entry spur junction boxes. Switches will be seen operating in production testing equipment, and a 7½ A 250 V appliance connector of new easy-grip design is shown for the first time.

Astral Equipment, Ltd., 96, Buchanan Street, Glasgow, C.1.—**Stand 154.**—The "Astral" free-standing refrigerator (illus.) and the table

Ashley C.1107 appliance connector



Arrow 30A magnetic contactor

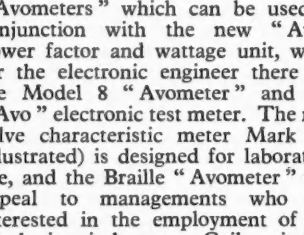
Astral free-standing model refrigerator

type suitable for the smaller kitchen are shown. Each incorporates an absorption unit, thermostatically controlled, and has a capacity of 1½ cu ft.

Astral Switchgear, Ltd., Alma Road, Enfield, Middlesex.—**Stand 142.**—L.v. distribution equipment of various types, fuse switches, fuseboards, busbar chambers, control panels and cubicles, switchboards, link boxes, multiway terminal units, adaptable boxes, heavy duty, surface, flush and weatherproof, fabricated steel housings, etc. The "Astral" fuse switches are for three ratings 60, 160 and 330 A 660 V, for B.S. 88 h.r.c. fuses.

Automatic Coil Winder & Electrical Equipment Co., Ltd., 92-96, Vauxhall Bridge Road, London, S.W.1.—**Stand 67.**—The power engineer will be interested in the Model 7 and 40 "Avometers" which can be used in conjunction with the new "Avo" power factor and wattage unit, while for the electronic engineer there are the Model 8 "Avometer" and the "Avo" electronic test meter. The new valve characteristic meter Mark III (illustrated) is designed for laboratory use, and the Braille "Avometer" will appeal to managements who are interested in the employment of the blind in industry. Coil winding machines will also be shown.

Backer Electric Co., Ltd., Fitzwilliam Road, Rotherham.—**Stand 12.**—Tubular sheathed heating elements covering industrial requirements, in a wide range of sheath materials, are illustrated by exhibits of heaters suitable for liquids, gases and solids. Water, oil and chemical immersion heaters, including thermostatically controlled units, are also shown. Intricate element formations indicate the wide range of application and the capability of supplying special designs and assemblies to suit the equipment and working conditions under consideration. Infra-red and bolt heaters are displayed together with many more applications.



Automatic Coil Winder Mark III valve characteristic meter

Astral 60 A fuse switch

Bakelite, Ltd., 12-18, Grosvenor Gardens, London, S.W.1.—**Stand 151.**—Besides examples of Bakelite laminated sheet, rod and tube, there are the new high-pressure glass laminates produced in three grades based upon melamine, silicone and phenolic resins to give a combination of improved electrical properties, heat resistance and strength. A range of "Vybak" p.v.c. materials includes resins, extrusion and moulding compounds and rigid and elastomeric sheet, providing good insulation combined with chemical resistance. A further display is composed of "Warerite" decorative panels (supplied by Warerite, Ltd., an associated company) for the construction of control boards.

H. J. Baldwin & Co., Ltd., 132, Arkwright Street, Nottingham.—**Stand 111.**—Mains Equipment Division: Representative selection of cable protection covers, stoneware conduits and precast concrete products, together with examples of transmission line steelwork and cabling accessories. Domestic Appliance Division: A full range of "Wireohms" heating elements, and de luxe models of the "Thermat" electric blankets and pads. Tools and Equipment Division: "Wilson" patented bench, machine and woodworkers' vices.

Barlow-Whitney, Ltd., 2, Dorset Square, London, N.W.1.—**Stand 122.**—A rotary tube furnace for the heat treatment of mass-produced components, and a muffle furnace for stripping Litz wire are shown in addition to standard process heating equipment and plant consisting of high vacuum and pressure impregnating plant, a range of industrial ovens, humidity test cabinet, wax and compound kettles, furnaces, dip tanks and pots and a variety of small industrial heating equipment.

Bastian & Allen, Ltd., Ferndale Terrace, Harrow.—**Stand 101.**—Two totally enclosed, fully automatic, packaged electrode steam boilers are on view: the "Stanmore" unit (illustrated) which will be in operation (the steam will be used in an all-glass heat exchanger) and the "Autolec" steam boiler, which has a load control relay for adjusting the load in steps of 10 per cent and pressure modulator which will maintain the pressure within 1 lb/sq in. Other exhibits are a "Bastian" 350 kW electrode steam boiler complete with control panel; 200 kW electrode hot water boiler with motorized load control suitable for space heating and thermal storage plant; "Speedylectric" 20 kW steam jet cleaner for steam cleaning and degreasing purposes; a humidifier and dehumidifier and an electric air heater suitable for plenum heating and grain drying; and "Hynes" type multi-pass design electric oil heater suitable for high temperature oil heating in the region of 300 deg C.

Geo. Becker, Ltd., Ampere Works, Northend Road, Wembley Park.—**Stand 73.**—A comprehensive range of wiring accessories includes 13 A sockets and plugs, 5 A a.c./d.c. flush and surface wall switches, bell pushes, ceiling roses, flex connectors and junction boxes. Among new products on display there are 5 and 15 A socket outlets with porcelain bases, flush and surface mounting types. The former are designed to fit the metal box to B.S. 1299. In addition, 2 and 5 A Bakelite fingershield plugs are shown.

Belmos Co., Ltd., Bellshill, Lanarkshire.—**Stand 209.**—Latest developments in the company's range of industrial and flameproof switchgear and control gear are displayed. Flush-fronted industrial starter switchboards of unit-type multi-tier construction are shown in a variety of colours and new industrial items include a five-tier starter housing for switchboards, a large multi-contactor starter unit and a contactor unit for use with capacitors for p.f. improvement.

Benjamin Electric, Ltd., Brantwood Road, London, N.17.—**Stand 211.**—Introduced for the first time is a modified design of the "Duoflux" floodlight for raising and lowering gear. New products include the "Duoflex" floodlight without inner reflector (illustrated) adapted for use where a shorter throw is required and special clamps to enable it to be attached to poles exceeding 4in diameter. Other exhibits include adjustable stops to enable large specular and vitreous floodlights to be freely swung in a vertical plane for cleaning and re-lamping; "Flurolier" fluorescent fittings in both "Crysteel" vitreous enamel and "Peropal" high temperature stove enamel; and the convector type "Mobilux" reflector employing the principle of through convection giving upward light whilst a through draught makes it self-cleaning. Among the range of outdoor units may be seen the new weatherproof cast-iron grip flange for easy wiring, which allows the reflector to be rotated after erection.

Best Products, Ltd., Felix Works, Felixstowe, Suffolk.—**Stand 173.**—This display includes the "Fanfare" kettle (illustrated), "Family Contract" kettle and Model 2 coffee percolator.

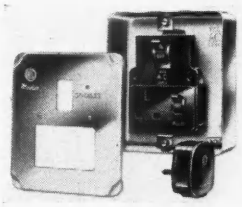
Bill Switchgear, Ltd., Aston Lane, Perry Barr, Birmingham, 20.—**Stand 143.**—A complete range of low voltage switch and distribution gear from 10 A

to 600 A is shown, including "Minax" distribution boards, and "Vertex" distribution boards with interchangeable carriers for arc damping or h.r.c. cartridge fuses. "Imperial Super K," "Royal," "Invicta," "Radette" and "Ultra" switches and switchfuses are exhibited and among domestic switchgear and accessories are "Insulok" switchfuses and switch splitters, metal-clad a.c. switchgear, and 5, 13 and 15 A switch-plugs and accessories. The "Master" cooker switch B.S. 1833 is shown for the first time and also the "Civic" consumers' 4, 6 and 8 way switchfuse unit, "Britannia" industrial type consumers' unit, 30 A pilot switch, 60 A d.p. a.c. switch and "Crown" 60 A four-way switch splitter. Angle glands, together with a range of switch fuseboards and a new type of enclosed cubicle switch panel, are also shown.

Black & Decker, Ltd., Harmondsworth, Middx.—**Stand 98.**—Industrial portable electric tools displayed include drills from ¼in to 1in capacity, 5 and 6in grinders, bench grinders, 6, 8 and 9in diameter saws, heavy duty sanders and internal combustion engine valve reconditioning equipment. The "Utility" display, designed for the home handyman, includes ¼ and ½in drills, 5in sander-polisher, 6in heavy duty saw and orbital sander.

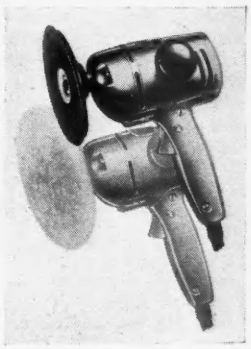
F. C. Blackwell & Co., Ltd., Great Crosby, Liverpool, 23.—**Stand 139.**—Among the range of "Blaco" conduit fittings are a number of items in zinc alloy made to B.S. 1004A. Recent introductions are plaster depth switch boxes with traditional switch fixing and the new B.S. 1299 switch fixing; also back-to-back switch boxes and switch and socket boxes for 13 A ring main wiring. There are also examples of junction boxes in copper for "Pyrotenax" and similar mineral insulated cables.

Thomas Bolton & Sons, Ltd., Mersey Copper Works, Widnes, Lancs.—**Stand 97.**—Exhibits include wire and strand, bar and rod, sheet, strip and foil, commutator and other sections, tubes and machine parts; "Combarloy" h.c. copper and chromium copper commutator segments and hard drawn high conductivity copper busbars; Bolton's patent cellular conductor,

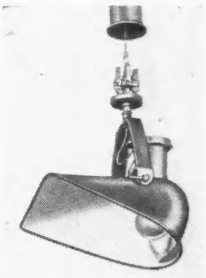


Bill "Master" cooker control unit to B.S. 1833

Best Products "Fanfare" kettle



Above: The Black & Decker 5in sander-polisher



Benjamin "Duoflux" floodlight

Left: British Electric Resistance Co.'s shunt field rheostat

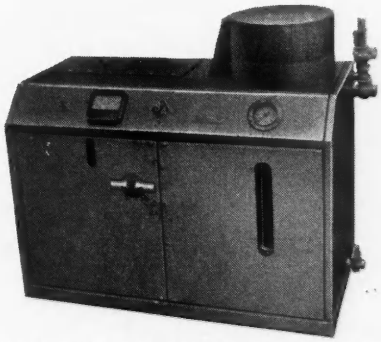
which has found its chief application in e.h.v. busbars and outdoor substations; and a display of rotor and stator end-rings (illustrated) constructed of copper and aluminium-nickel-iron bronzes.

S. O. Bowker, Ltd., 19-21, Warstone Lane, Birmingham, 18.—**Stand 141.**—On show here are wiring accessories, including junction boxes, ceiling roses, switches, socket outlets, wiring systems for l.s. and c.t.s. cables, etc.

Geo. Bray & Co., Ltd., Leicester Place, Blackman Lane, Leeds, 2.—**Stand 76.**—A selection of products by both the Electrical and the Ceramics Divisions is shown. Electric heating elements, all of the refractory-embedded metal-sheathed type, are available in strip, ring, pad, cartridge and sheathed wire form. Samples of complete air heater batteries and immersion heaters are also displayed. The Ceramics Division specializes in the mass production of electro-ceramic insulators to close dimensional tolerances in a variety of bodies and a large range of standard tubes, beads, bushes and washers is being shown.

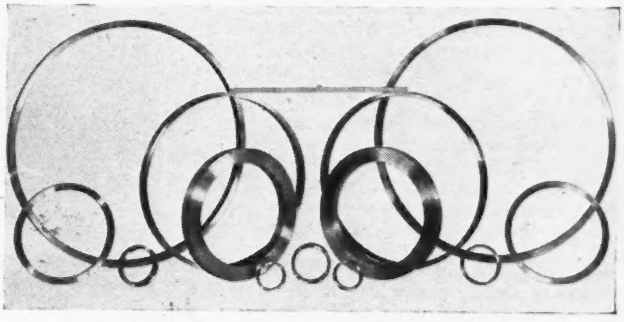
British Central Electrical Co., Ltd., 6 & 8, Rosebery Avenue, London, E.C.1.—**Stand 200.**—New products shown include a loop impedance tester, geared reduction drives for ships' lifeboat davits, "Ministak" stackable storage units, and the universal "Briticent" progress flux pump. Among other exhibits are the "Gripper" handlamp range; portable fluorescent aircraft lighting sets; full load earth tester; "Erecto" slotted angle racking; "Sherpa" hydraulic lifting trucks; "Kopex" flexible conduit; Pyrotenax cable; portable tools; heating and ventilating equipment; motors; switchgear; drilling machines; instruments; lighting fittings; trunking and trunking fittings.

British Electric Resistance Co., Ltd., Queensway, Enfield, Middx.—**Stand 168.**—A new type of shunt field rheostat having the element and studs embedded in vitreous enamel will be shown together with sliding resistances



Bastian & Allen "Stanmore" electrode steam boiler unit

Display of Thomas Bolton rotor and stator end-rings



for laboratory, industrial and switchboard use and vitreous enamelled resistances from 6 to 180 W. The "Regavolt" industrial regulating transformer is on view in hand operated, motor driven and automatic forms for voltage stabilization and control; also the new rotary variable transformer for laboratory use and building into equipment in single- and three-phase types and with motor drive.

British Electrical & Allied Industries Research Association, 5, Wadsworth Road, Perivale, Greenford, Middx.—**Stand 20.**—Some of the investigations in progress at the Association's laboratories and extramurally are shown, with photographs, literature and technical reports illustrating other activities. The advisory and information services available to members are indicated. Working demonstrations are included.

British Electrical Development Association, 2, Savoy Hill, London, W.C.2.—**Stand 22.**—The display comprises an illustrated report of a year's activities of the Association, together with highlights of many of its activities.

British Electricity Authority, Winsley Street, London, W.1.—**Stand 30.**—The progress of the electricity supply industry during the past 34 years is described and illustrated, including the new plant programme up to 1959, the B.E.A.'s collier fleet and the advance made in rural electrification and the development of pulverized fuel ash as a building material. Information and publications are available at an information desk on the stand and tickets can be obtained daily for afternoon visits to Battersea and Fulham power stations.

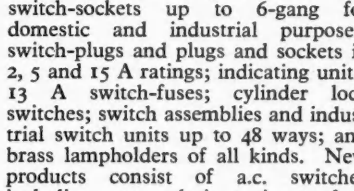
British Insulated Callender's Cables, Ltd., Norfolk House, Norfolk Street, London, W.C.2.—**Stand 109.**—Cables include mass-impregnated non-draining paper-insulated types up to 11 kV, rubber and thermoplastic cables and flexibles for power, lighting and telecommunications, wiring systems, and extensible t.r.s. flexibles. Among cable accessories are l.v. indoor terminal boxes (illustrated), consumers' service units, detachable fused tee boxes, pressed copper and lead service boxes, and claw type cable cleats. Power capacitors, the "Bimec" fault locator, earthing equipment, busbars, "Bicaloy" metal and electrodes for resistance welding, winding wires and strips, and current collection equipment for cranes and conveyors are also displayed.

British Thomson-Houston Co., Ltd., Rugby.—**Stand 71.**—Electric motors being shown include f.h.p. machines, variable-speed a.c. commutator motors and examples from the range of totally-enclosed, fan-cooled B.S. dimension motors. Developments in electronics engineering include working exhibits of a magnestat voltage regulator; a high-speed batch counter; a "Dekatron" timer for welding machines; and the application of photo-electric equipment to a conveyor system. "Clearcall" industrial communication equipment is also being shown. Items from the range of switchgear include the recently introduced 3-phase automatic circuit-recloser for improved continuity of supply on rural transmission lines up to 11 kV and a metalclad class "QA" airbreak air-insulated vertical-plugging switchgear equipment. "Mazda" lamps and lighting fittings include equipment for blended lighting and for use in stores and shops. Besides lamps and fittings from the fluorescent range there are the new system of "Invertrunking"; street lighting equipment; and a 1 kW mercury-arc lamp and reflector fitting.

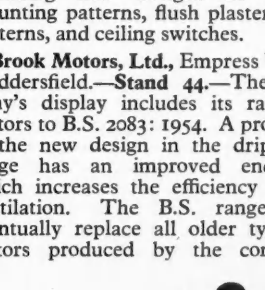
Britmac Electrical Co., Ltd., 121, Victoria Street, London, S.W.1.—**Stand 25.**—Installation accessories of all types for domestic and industrial use are exhibited, including switches, 5 A and 15 A surface, semi-recessed, flush and ceiling patterns; a range of 13 A accessories including sockets and switch-sockets up to 6-gang for domestic and industrial purposes; switch-plugs and plugs and sockets in 2, 5 and 15 A ratings; indicating units; 13 A switch-fuses; cylinder lock switches; switch assemblies and industrial switch units up to 48 ways; and brass lampholders of all kinds. New products consist of a.c. switches including new designs in surface mounting patterns, flush plaster depth patterns, and ceiling switches.

Brook Motors, Ltd., Empress Works, Huddersfield.—**Stand 44.**—The company's display includes its range of motors to B.S. 2083: 1954. A prototype of the new design in the drip-proof range has an improved endshield which increases the efficiency of the ventilation. The B.S. ranges will eventually replace all older types of motors produced by the company, affording the advantages of interchangeability in physical dimensions. New enclosures have been designed for larger motors from 75 to 500 h.p. in the drip-proof type and 40 to 175 h.p. in the totally enclosed fan cooled type. Special features are the loose louvres on the ventilation ports which can be rotated through 90 deg; and the advanced method of internal and external ventilation. Cartridge type bearings enable the motors to be dismantled without disturbing them. Both enclosures may be supplied as cage or slip-ring types. Brush lifting and short circuiting gear with electrical interlock are included as standard. A selection of f.h.p. motors in a variety of enclosures and types will be available, together with control gear for automatic push button or hand operation.

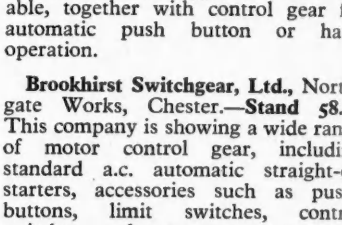
Brookhirst Switchgear, Ltd., Northgate Works, Chester.—**Stand 58.**—This company is showing a wide range of motor control gear, including standard a.c. automatic straight-on starters, accessories such as push-buttons, limit switches, control switches and components such as contactors, relays, isolating switches, etc. Special equipment includes a new type mimic flow diagram control board designed for industrial materials-handling installations. Another exhibit demonstrates the control of automatic electrically-operated soot-blower units. A novel item is a straight-on starter with plug-in interior to facilitate rapid replacement under fault conditions. It is suitable for up to 7½ h.p. 400/440 V



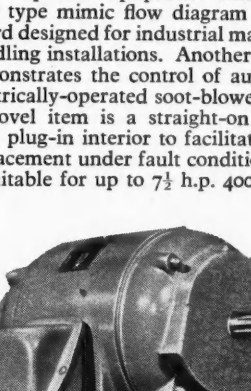
B.I. Callender's l.v. indoor terminal box



New type Burgess micro-switch



Brook B.S. drip-proof motor up to 25 h.p.



Bryce standard tank type capacitor

and can be arranged for local or remote control.

Browning's Electric Co., Ltd., Boleyn Castle, London, E.13.—**Stand 95.**—Among the products exhibited are commutators and slip-rings, soldering irons, geared motors, rotary junction boxes, examples of armature, stator and coil windings, control panels, quick-acting welding clamps, solenoid operated valves and motorized valves.

Brush Electrical Engineering Co., Ltd., Loughborough, Leics.—**Stand 70.**—Switchgear and fuse-gear exhibits include two examples of air insulated vertical isolation horizontal drawout switchgear incorporating plain break bulk-oil-content circuit breakers, one of the single busbar type and the second designed to accommodate duplicate busbars. A new 11 kV unit incorporates a circuit breaker fitted with a cross jet arc control device. The wide range of induction motors from 1 to 3,000 h.p. comprises a selection of motors of various types including screen protected, slip-ring, surface cooled slip-ring, flameproof and small B.S.D. types. An alternator exhibited is a self-regulating 58/67·5 kW machine fitted with "Amplidex" control, 415/240 or 208/120 V, 50/60 c/s, 1,000/1,200 r.p.m. D.c. machines are represented by a 250 kW generator, 220 V, 750 r.p.m. Transformers cover a range extending from 50 to 45,000 kVA and the exhibit will consist of a 300 kVA transformer (core and coils) made to B.E. specification T.1. A model of a Brush Ljungstrom turbo-alternator set representative of sizes with outputs up to 30,000 kW and a model of a Brush axial-flow back pressure set will also be on view.

Bryce Electric Construction Co., Ltd., Kelvin Works, Hackbridge, Wallington, Surrey.—**Stand 100.**—This stand is mainly devoted to the display of power transformers and power factor improvement capacitors. The largest unit on show is the core and coils of a 1,250 kVA, 6,500/408 V, three-phase, 50 c/s oil immersed transformer. A 10 kVA single-phase transformer and a 100 kVA pole mounting unit represent the distribution range. From the power capacitor range several types are on view, including a tank type unit fitted with a contactor and provided with "Perspex" inspection panels to enable the constructional detail to be examined. The use of capacitors is illustrated by an instrument panel which shows the reduction in current effected by the connection of a capacitor to an induction motor.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham, 1.—**Stand 134.**—The "Birmingham" range of "B.K.B." electric motors (made by this company) includes single-phase motors from ½ to 1½ h.p., three-phase motors from ½ to 7½ h.p., d.c. motors from ½ to 7½ h.p., shunt and compound d.c. generators up to 6 kW, self exciting, self regulating single and three-phase alternators up to 22 kVA, flange mounting a.c. and d.c. machines, motor generator and motor alternator sets and high frequency generators. The "Luton" range (manufactured by George Kent, Ltd.) includes single and three-phase motors up to ½ h.p., universal motors up to ⅛ h.p. at speeds up to 10,000 r.p.m., synchronous, capacitor and induction instrument motors, motor reduction gear units, sewing machine motors and foot controls, and small rotary transformers for telecommunications.

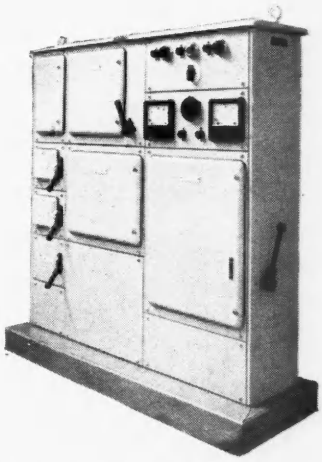
There are a number of examples from the "Swan" range of electric kettles and appliances, each appliance having the heating element displayed alongside, and special immersion elements for domestic and industrial applications.

Burgess Products Co., Ltd., Micro Switch Division, Dukes Way, Team Valley, Gateshead, 11.—**Stand 214.**—Among a wide selection of "Burgess" micro switches is a new switch which, in addition to providing the usual protection against accidents to operators of cubicled h.v. equipment, affords a simple and quick method of maintaining the equipment in its operative condition while the service engineers require it open.

Cable Makers' Association, High Holborn House, 52-54, High Holborn, London, W.C.1.—**Stand 10.**—Illustrated panels in colour describe the achievements and interests of the Association, the names of the 17 members being displayed together with their individual trade marks, in colour.

Cantie Switches, Ltd., Port Causeway, New Ferry, Birkenhead.—**Stand 58.**—Centralized control of electric drives, heating and lighting plant, etc., is well catered for by the "Minunit" cubicle switchboard, which is the principal feature of the display. These switchboards are built to meet customers' requirements, but the components are of standard dimensions designed to fit into the various standard size apertures formed by the steel channel sections of which the framework is made. In most cases the switches and switch-fuses are withdrawable as complete units from the front, thus simplifying maintenance. The company is also showing selections from its range of normal and heavy-duty switches and switch-fuses and flameproof gear.

Cayson Electrics, Ltd., 139, Queens Road, Watford.—**Stand 104.**—On this stand are to be seen transformers and rectifying equipment embodying metal rectifiers. The transformers include open and enclosed double-wound air cooled, oil insulated, single and three-phase types suitable for l.v. lighting, operating portable tools, mains conversion, arc furnaces, bell operation and laboratory use. Rectifying equipment for battery charging, emergency lighting, telephone systems and engine starting is exhibited as well as fluorescent control gear.



Cantie Switches "Minunit" cubicle switchboard

"Chilton" electric hair clipper

Channel Conduits, Ltd., 11, Victoria Street, London, S.W.1.—**Stand 3.**—The principal exhibit is the company's standard range of spring capped patented cable trunking, complete with accessories. A new product is the "Pancake" over floor ducting system designed for offices and showrooms.

Chilton Electric Products, Ltd., Hungerford, Berks.—**Stand 180.**—The "Atlas" miniature h.r.c. circuit breakers and "Chilton" voltage operated earth leakage circuit breakers are demonstrated. The new "Chilton" electric hair clipper is designed for domestic use and the universal shaver conversion kit enables any dry shaver to be used on practically any socket or output voltage. A new universal shaver socket incorporates a 5 A 3-pin power outlet in addition to the normal shaver outlet facilities. "Buk" and "Kub" dry shavers and accessories are also exhibited.

Chloride Batteries, Ltd., Exide Works, Clifton Junction, Swinton, Manchester. — **Stand 137.** — Besides completely automatic "Keepalite" emergency lighting equipment with its associated battery of 26 glass box type cells, there is a new high performance cell for switchgear operation and examples from the "Exide-Ironclad" range of traction batteries.

Clang, Ltd., Crown Yard, Cricklewood, London, N.W.2.—**Stand 121.**—This exhibit embodies a full range

of electrical accessories, including switches, plugs, sockets and adaptors. The company's 5 and 15 A ejector plugs and the dimmer switch are included.

Clare Instrument Co., 8, South Street, West Worthing.—**Stand 208.**—Industrial test gear shown includes insulation testers, ohmmeters, limit bridges and the new direct reading thermometer bridge for the swift determination of the temperature rise of copper conductors, etc. This instrument can also be used as a Wheatstone bridge or as a limit bridge, with a " per cent deviation " scale.

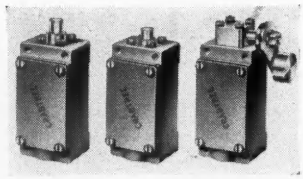
E. K. Cole, Ltd., Ekco Works, Southend-on-Sea. — **Stand 113.** — Equipment covering all general space heating requirements includes floor-standing and wall-mounting convection heaters, inset convectors, " Radiant Glass " thermopanels, high temperature panels, unit heaters, " Thermotube " equipment and thermostatic control gear. New products include flameproof " Thermotubes " (type " F.P.") suitable for use where group II inflammable gases are present, a watertight thermostat (type " WT ") and high temperature panels (type " HTP ").

Contactum, Ltd., Victoria Works, Edgware Road, Cricklewood, London, N.W.2.—**Stand 195A.**—On show is a range of switches, switch-plugs, socket outlets, bell pushes, ceiling roses, junction boxes, iron connectors, socket adaptors, striplite holders and steel and wood boxes.

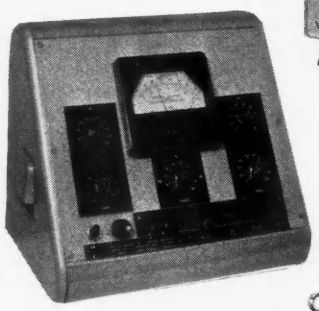
Courtney, Pope (Electrical), Ltd., Amhurst Park Works, London, N.15.—**Stand 212.**—Among new developments in lighting fittings are the " Atomette " silhouette spot unit which incorporates the " Stelmar " optical system for store lighting and the " Hy-Ray " adjustable window fitting. Other items include the " Controlite " clip-on reflector for increasing and controlling the intensity of standard tungsten lamps, the " Flouvre " anti-glare attachment and the " Hyliter " and " Petite " range of fittings.

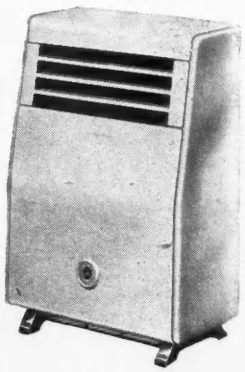
J. A. Crabtree & Co., Ltd., Lincoln Works, Walsall.—**Stand 59.**—A wide range of wiring accessories, motor starters and remote control stations includes a.c. flush switches (in single and twin unit form) together with their associated boxes of wood, steel and cast iron. The D-6 hand operated starter for f.h.p. motors is available in patterns suitable for inset, flush and surface mounting. The range of A-15 (oil break) motor starters and ancillary fittings for conduit, fuse or isolator is iron cased and intended primarily for surface mounting. The B-15 range of control gear includes direct-on, star-delta, pole changing and reversing switches for inset, surface or flush mounting. The range of remote control stations for employment with motor starters includes pilot lights, suspension and push-button stations. A selection of limit switches available with a variety of forms of operating head for either snap or slow action is being presented for the first time in addition to an extensive display of 13 A switched and unswitched socket-outlets.

Chloride Batteries " Keepalite " charging/control cubicle



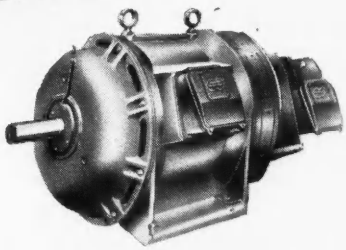
Crabtree limit switches for either snap or slow action





Above: " Thermovent " SRC1 convection heater (E. K. Cole, Ltd.)

Left: Clare direct reading thermometer bridge



Crompton NK range fan-cooled induction motor

Crompton Parkinson, Ltd., Crompton House, Aldwych, London, W.C.2. —**Stand 110.**—Induction motors include examples from the latest slip-ring and squirrel-cage " N " range which covers types with screen-protected, drip-proof or pipe-ventilated enclosures of 80 to 1,200 h.p. and totally-enclosed fan-cooled types of 80 to 600 h.p. " A " type f.h.p. motors conform to the International C.E.E. and Canadian Standards Association specifications as well as to B.S. 170 and B.S. 2048. Motors from $\frac{1}{8}$ to $1\frac{1}{2}$ h.p. for industrial applications conform to B.S. 2048 and certain frame sizes include the Marathon Mk. II bearings. The lighting display is exclusively devoted to " New-Range " fluorescent fittings of which there are 54 to meet the various individual lighting requirements of industrial and commercial premises and schools. The transformer-rectifier unit for both stud welding and metallic arc welding being shown for the first time gives a choice of three outputs by means of a 3-position switch providing stud welding up to $\frac{1}{2}$in diameter, single operator arc welding up to 400 A, and double operator arc welding up to 200 A each. The C.P. Stud Welding Organization also exhibits models of " Nelson " and " Cyc-Arc " equipment and demonstrates the welding of ferrous and non-ferrous metals.

D.P. Battery Co., Ltd., Bakewell, Derbyshire.—**Stand 65.**—A 10,000 Ah stationary cell is typical of those supplied to hundreds of generating stations and telephone exchanges all over the world. There are smaller cells for such duties as emergency lighting, switch tripping and closing, railway signalling, country house lighting and radio transmission. " Kathanode " traction batteries are also shown, with other cells of " Kathanode " construction for marine applications and diesel engine starting on railway locomotives.

Davis Sheet Metal Engineering Co., Ltd., Eley's Estate, Angel Road, London, N.18.—**Stand 52.**—Cable trunking with " quick-fix " covers and a comprehensive range of accessories will be shown together with underfloor and flush-mounting types. With tap trunking, available in 60 and 100 A sizes, fuse boxes can be erected at any position. Other products are busbar trunking and standard busbar chambers, riser and link boxes, and the " Davis " busbar clamp type socket which obviates drilling of busbars. The " Quick-Punch," a portable power press, will be demonstrating conduit hole cutting in trunking.

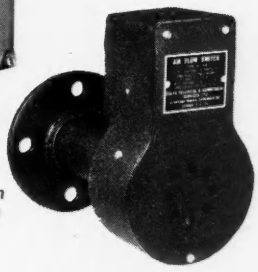
Dawe Instruments, Ltd., 99, Uxbridge Road, London, W.5.—**Stand 73.**—A device for the rapid determination of moisture in timber is included in the company's display of measuring instruments for research and industry. Others are a frequency meter, a stroboflash, a mains frequency stroboscope, a dynamic balancing machine and a sound level indicator.

Delta Technical Services, Ltd., Fairfield Road, Kingston-on-Thames, Surrey.—**Stand 91.**—The display of

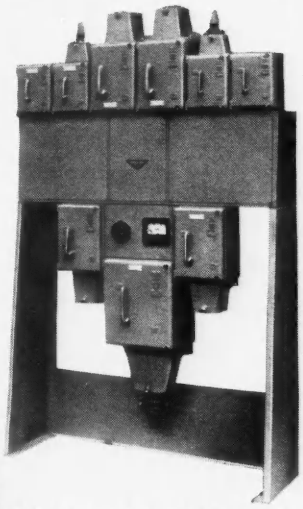
pressure, vacuum and flow operated switches for industrial, electronic and general factory applications includes the "M1/M4" air flow switch for use as a control or safety device on air supplies at low values of pressure or suction. It may also be used in connection with drying or enamelling plants.

D.P. Battery Co.'s 10,000 Ah capacity stationary cell

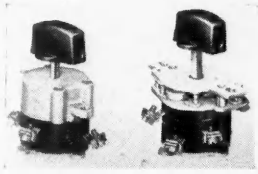
Donovan light pattern foot operated switch



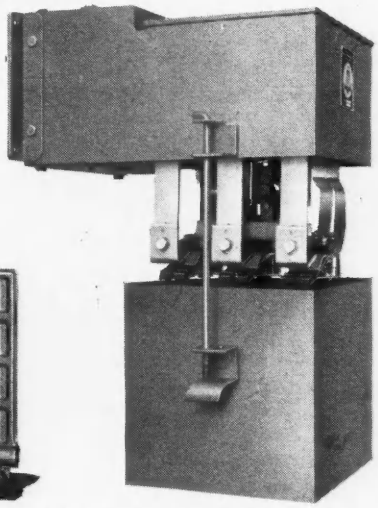
Left : Delta "M1/M4" airflow switch



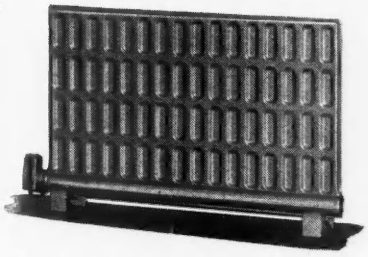
Typical Dorman & Smith T.S. switchboard



Diamond "H" a.c. (left) and a.c. d.c. packet switches for motor control



British Klockner DI.200 oil-immersed contactor



Dimplex 1½ kW oil-filled radiator, with feet

"Diamond H" Switches, Ltd., Gunnersbury Avenue, London, W.4.—**Stand 164.**—A.c. and a.c./d.c. rotary reciprocating heater switches suitable for use on cookers, washboilers, washing machines and drying cabinets are among the exhibits. Of special interest to cooker manufacturers is a range of thermostats recently designed and incorporating front-of-panel calibration, positive mechanical indexing, plug-in neon pilot lighting and a special magnetic control device. The new 3-stage pre-heat bake and grill instrument is also being demonstrated. For both industrial and domestic equipment there is a range of 1·5 to 60 A toggle switches, snap-in neon indicators and snap-on toggle switches, multi-circuit a.c. switches with provision for 12 positions, and a full range of rotary packet switches, 5 to 60 A. New products include oven thermostats, 6 A toggle switches and 6 A cord switches.

Dimplex, Ltd., Totton, Southampton.—**Stand 43.**—The company's range of oil-filled radiators now includes modifications to the thermostat by incorporating additional air vents in the cover, thereby improving the efficiency of the bi-metal strip; ¼in holes have also been introduced in the feet of the radiators which must now be screwed to the floor when fitted in bathrooms. Feet or castor wheels of column type radiators are now interchangeable. A range of Buxton approved flameproof radiators is also on view.

Donovan Electrical Co., Ltd., 70-82, Granville Street, Birmingham, 1.—**Stand 128.** — A.c. direct-switching starters up to 75 h.p., both standard and reversing patterns in various sizes and types, and special control panels are shown, together with a variety of limit switches, foot switches, push-buttons, float switches, relays and other control devices. Heavy duty "Donlok," "Safuse" and "Scrutact" ironclad switch and fuse gear and "Reylovolt" low voltage transformers are also represented as well as "Runtact" enclosed overhead busbar ducting for feeding hoist blocks, cranes or portable tools. On show for the first time is a new light pattern foot-operated switch.

Dorman & Smith, Ltd., Ordsal Electrical Works, Manchester, 5.—**Stand 199.**—Visitors to the stand will have an opportunity of viewing demonstrations of the "Dorman" system of switchboard construction. Cubicle switchboards, also exhibited, show how the company's switches can be easily installed in existing boards with a minimum of structural alterations. The range of fused switches has been extended to include 30 A to 300 A types, including flush fitting and those with brass base connectors. Distribution fuseboards include the 500 V "Flowline" design, surface or flush types, with rewirable fuses or h.r.c. cartridge fuse links. Also exhibited are "Safeset" miniature circuit breakers and the "Diolux," "Diolume" and "Diopal" range of prismatic lighting fittings.

D.S. Plugs, Ltd., show many different types of fused plugs and sockets; also cooker control units.

British Klockner Switchgear, Ltd., demonstrate the complete versatility of their switchgear and show examples from their range, including remote control and push-button starters, rotary switches, limit switches and contactors, both oil immersed and air-break types.

Alorite, Ltd., show examples of ceramics for grinding, textile guides and terminal posts, and a range of h.r.c. cartridge fuse links.

Dowding & Mills, Ltd., Camp Hill, Birmingham, 12.—**Stand 175.**—Motor stators, partly wound showing the methods and materials employed, together with one completely wound

and finished are on view, also a sample of the workmanship and materials which go into a d.c. armature rewind; samples of mica mouldings for h.v. coils, together with h.v. and l.v. transformer coils; and equipment used for the reclamation of worn components by the company's metal spray process with typical examples of its normal application.

Dubilier Condenser Co. (1925), Ltd., Ducon Works, Victoria Road, London, W.3.—**Stand 150.**—Exhibits include power factor correction capacitors, with automatic control equipment, and a p.f. correction demonstration set, operating to show the reduction in current and kVA; "Duconol" capacitors for fluorescent lighting and other a.c. applications; "Drilitic" capacitors for a.c. capacitor start motors; mains suppressor plugs for radio interference suppression; h.v. and h.f. resistors; power wire wound resistors; automatic voltage regulators; electro-magnetic relays for a.c. and d.c. circuits; and tubular rheostats and resistances.

E.F. Electric, Ltd., Willow Lane, Watford, Herts.—**Stand 105.**—A complete range of wiring accessories includes 2, 5, 13 and 15 A switch-sockets and plugs in both flush and surface patterns.

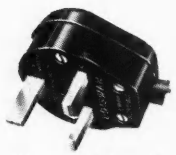
E.M.I. Electronics, Ltd., Hayes, Middlesex.—**Stand 206.**—The three new models of stroboscopic balancing machines capable of dealing with rotors having diameters up to 24in and weighing 150 lb will cater for a greatly extended range of applications. These machines, built on a very heavy cast framework, are designed to measure out-of-balance forces producing displacements as small as 0·000025in. The amount of unbalance is visually indicated on a meter and the position of unbalance by a stroboscopic lamp. Two smaller balancing machines, similar in principle and operation and designed for loads of 30 lb and 7 lb respectively, with maximum diameters of 11in and 4in, are also being shown. The 3B high-power stroboscope is for the measurement of speed and the observation of rotary and reciprocating mechanisms of all kinds and for special applications in the electro-medical field, particularly in conjunction with the electro-encephalograph for the examination of brain waveforms. There will also be frequent showings of a film dealing with the stroboscope.

E.M.S. Electrical Products, Ltd., 28-32, The Butts, Coventry.—**Stand 132.**—Enclosed collection tracks for movable equipment include a single-phase trolley duct feed rail for portable tools, cutters, lights, etc.; the three-phase "Uniduct" feed rail for cranes, hoists, high frequency tools, rest tracks, etc.; and the "Minibus" miniature busbar distribution system for machine shops. Two new products are the "Miniplug" lighting and power distribution system and a 4-bar "Minibus" miniature distribution system.

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2. —**Stand 69.**—Shallow trunking for all types of lighting fittings and light duty power operated equipment is shown. Lighting equipment includes standard fluorescent fittings, "Blendolite" industrial blended light units and street lighting lanterns. Among new items from the Ediswan "Harcourt" range are two decorative pendants, a 100 and 150 W recessed ceiling fitting, and a spun aluminium twin cone reflector 60 W wall bracket. Special hospital fittings are also on show as well as two standard types of "Ensur-a-lite" emergency lighting equipment and a combined battery and charger unit. An extensive display of wiring accessories includes new 5 and 15 A "Avon" switch socket outlets and a new 13 A fused plug. Displays of cables and "Royal Ediswan" lamps complete the exhibit.

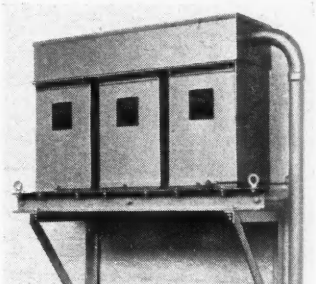
Ekco-Ensign Electric, Ltd., 45, Essex Street, Strand, London, W.C.2.—**Stand 60.**—A range of over 160 industrial, commercial and decorative fluorescent lighting fittings includes the new 5ft 80 W slim batten fitting "Ekcowhite" lamps, together with other shades and colours of "Ekco" fluorescent lamps for industry and commerce. Tungsten lamps are also shown as well as a range of fluorescent control gear and accessories.

Electric Construction Co., Ltd., Bushbury Engineering Works, Wolverhampton.—**Stand 197.**—Entries from the different sections of the company's manufactures include a typical machine of each of the eight frame sizes covered by B.S. 2083 (motors up to 25 h.p., 400 V); 32in diameter d.c. motor armature and commutator; direct-on push-button type contactor starters for small and medium squirrel cage machines; two "O.K." type draw-out pattern industrial circuit-breaker units made in capacities up to 800 A, 400 V, and up to 300 A, 3·3 kV; 500 A, 8 V plating rectifier unit, with interior arrangements for examination; 100 kVA, 11 kV/433 V, 3-phase 50 c/s pole-mounting type transformer; Ward-Leonard package type drive for

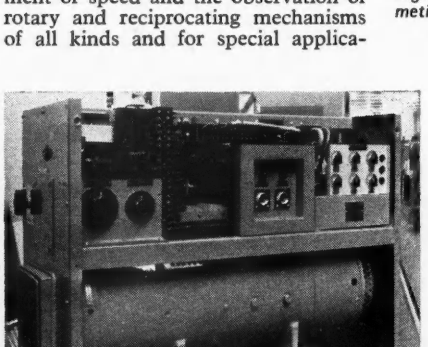


Above: "Ediswan" 13 A fused plug

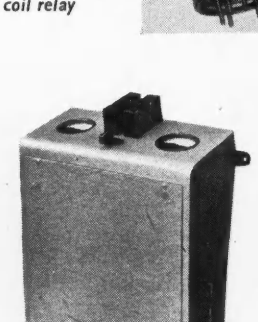
Right: Elliott hermetically sealed moving coil relay



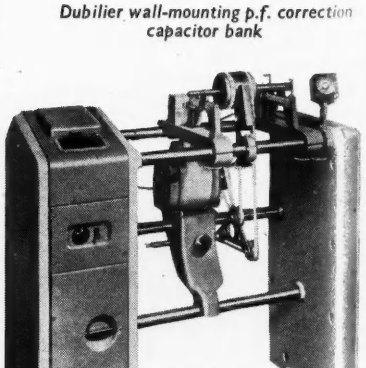
Dubilier wall-mounting p.f. correction capacitor bank



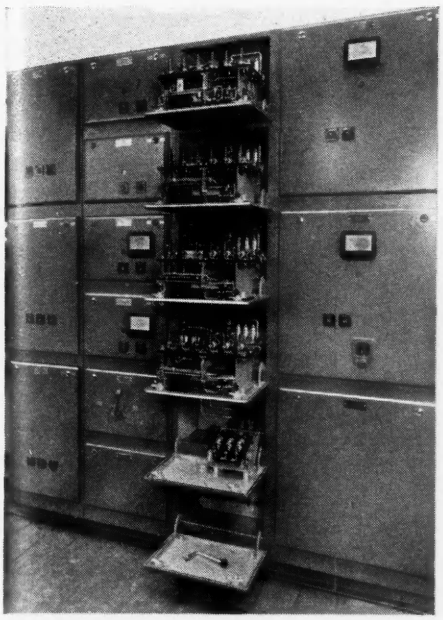
Electric Construction Co.'s Ward-Leonard package drive with cover removed



Engel & Gibbs "On-Demand" control panel

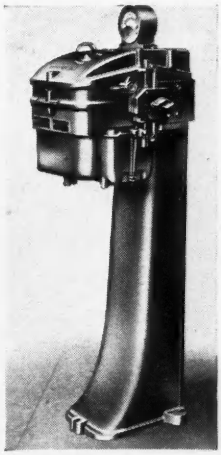


E.M.I. dynamic balancing machine

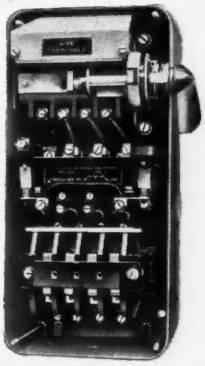


Electro Mechanical Manufacturing Co.'s unit type all-isolating flush fronted cubicle board

Ekco-Ensign slim batten fluorescent fitting



George Ellison 20 A direct-to-line starter



Electrical Apparatus Co.'s MF2L direct switching starter with isolator

applications where wide range of rapid speed control is necessary; and moving-iron and moving-coil type ammeters and voltmeters, ranging from the 2in size to the larger sector pattern instruments.

Electrical Apparatus Co., Ltd., St. Albans.—**Stand 32.**—On the company's stand there are a.c. and d.c. manually-operated and fully automatic motor control gear and accessories, industrial and flameproof types; a range of direct-on push button starters up to 7½ h.p. including the "Autette" and "MF2" autoswitches; and cubicle type fully automatic panels. A section is devoted to d.c. air-break and oil immersed equipment and a.c. contactor-type units for all types of starters. Accessories include float switchgear, rotary selector switches, local and remote push button control, etc.

There are display panels covering a full range of moving iron and moving coil measuring instruments, frequency meters, relays, etc. Demonstrations include a microammeter protected against 1,000 times the rated current by a rectifier-arrangement; a pneumatic timer unit operated in conjunction with coil and relay; and single-phasing correction on a running fan motor.

Electrical Association for Women, 35, Grosvenor Place, London, S.W.1. —**Stand 7.**—This display centres round the recent kitchen replanning competition, and a plan and model of the winning kitchen are on view. The new E.D.A. film, "Willing Does It," is also being shown.

Electrical Contractors' Association (Inc.), 14, Bedford Row, London, W.C.1.—**Stand 13.**—The stand illustrates the scope of the E.C.A. organization, the work of its members and the activities of the Association within the electrical industry.

Electrical Industries Benevolent Association, 32, Old Burlington Street, London, W.1.—**Stand 6.**—There is an information bureau giving particulars of the activities of the E.I.B.A. and an outline of the scope of the work organized at the head office and through forty-seven area branches. Copies of the year book and other material are available.

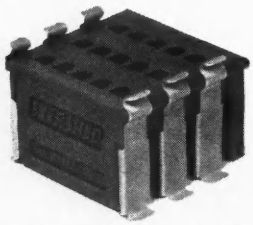
Electrical Review Publications, Ltd., Dorset House, Stamford Street, London, S.E.1.—**Stand 23.**—Representatives are available at this stand to deal with inquiries relating to all matters connected with the electrical industry, and there is a display of up-to-date and authoritative technical books on various aspects of electrical engineering.

Electro Mechanical Manufacturing Co., Ltd., Marlborough Street, Scarborough.—**Stand 75.**—The unit type all-isolating flush fronted cubicle board shown is designed for up to 660 V and 125 h.p.

Elliott Bros. (London), Ltd., Century Works, London, S.E.13.—**Stand 170.**—A new introduction is the hermetically sealed moving coil relay which is constructed on a standard valve base that can be plugged into a valve holder in exactly the same way as a valve. Among a range of electrical instruments and industrial measurement and control equipment are a high stability power frequency generator, an a.c./d.c. comparator, transformer test sets, Wheatstone bridges, reflecting dynamometer instruments, etc. Recorders, both portable and panel mounting types, cover miniature, standard and potentiometer models. On a panel representing the various steps in power generation are displayed a new CO_2 meter, together with a range of switchboard instruments.

George Ellison, Ltd., Perry Barr, Birmingham, 22B.—**Stand 124.**—A comprehensive display of Ellison switchgear ranges from an 11 kV circuit breaker unit to limit switches and emergency push switches. Of special interest is a new direct-on-line oil-break starter and circuit breaker rated at 20 A maximum and suitable up to 660 V, ASTA tested with h.r.c. back-up fuses mounted in the isolator and a proved breaking capacity of 33,000 A at 600 V. Modifications to the company's oil-cooled rotor for slip-ring induction motors include a new arrangement of the correct starting sequence device which enhances its suitability for service in dirty or dusty situations. In the larger gear there are an 11 kV 250 MVA vertically-isolated circuit breaker unit and a distribution switchboard, both ASTA tested to B.S. 116: 1952. Other exhibits are circuit breakers, star-delta starters, crane control equipment, resistors, tappet operated limit switches, a reversing switch and push switches, and cable end couplings.

Enfield Cables, Ltd., Victoria House, Southampton Row, London, W.C.1.—**Stand 86.**—Display boards show the range of the company's cables and wires. Also to be seen are p.i. cables, compression cable up to 275 kV, non-bleeding cables, varnished cambric cables, r.i. cables and flexibles, p.v.c. and polythene insulated cables, mining cables, signalling and telephone cables, copper wire and strand, p.b.j. and braided aerials, wires and strips for transformer and machine winding, enamelled copper wire, "ENbestos" fire resisting wires and cables, joint boxes and jointing material and the grid suspension wiring system.



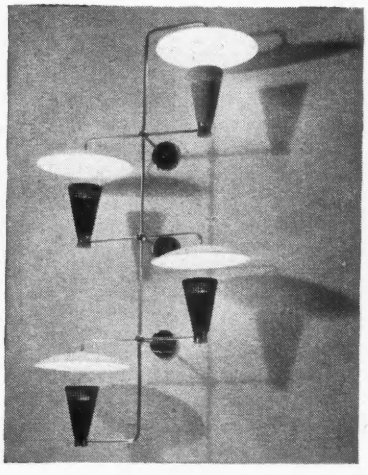
Evershed & Vignoles improved cable cleat

Engel & Gibbs, Ltd., Warwick Road, Boreham Wood, Herts.—**Stand 21.**—The company is showing three ranges of mercury relays and contactors, automatic diesel control panels of the "on demand" and "remote control" types, contact thermometers and plug-in relays for a.c. or d.c. miniature telephone relays.

English Electric Co., Ltd., Marconi House, Strand, London, W.C.2.—**Stand 41.**—Equipment exhibited is from eleven of the company's departments and includes motors, switchgear and fusegear, transformers, instruments, meters and relays, as well as domestic appliances. Many examples of both protected and totally enclosed types of motors from ¼ to 30 h.p. are on view and a new f.h.p. motor protection device, giving complete fault protection, is shown for the first time. Another interesting exhibit is an electrically operated linear actuator for the remote control of boiler dampers. The display of switchgear and fusegear includes "Superform" fuseboards and isolators, substation equipment, overhead busbar equipment, fuse links and cartridge fuses, as well as an "Isolector" mechanism as fitted to 3·3 kV circuit breakers. An outdoor 33 kV oil circuit breaker, type "OKM4," and oil filled bushing assemblies are also displayed. Display cabinets and demonstration panels carry an assortment of portable and switchboard instruments and meters as well as a selection of relays, including the "YCG" distance relays. Other exhibits include an electric hand dryer, a tumbler dryer and an automatic cooker. In "Motor Way" the company is contributing a squirrel-cage, induction motor and magnetic slip coupling. The unit is complete with a supporting bed-plate and outdoor pedestal bearings.

English Electric Valve Co., Ltd., Waterhouse Lane, Chelmsford, Essex.—**Stand 119.**—Valves chosen for display include special types for r.f. heating, transmitting valves, rectifiers, klystrons, magnetrons, voltage stabilizers, image orthicon camera tubes and thyratrons.

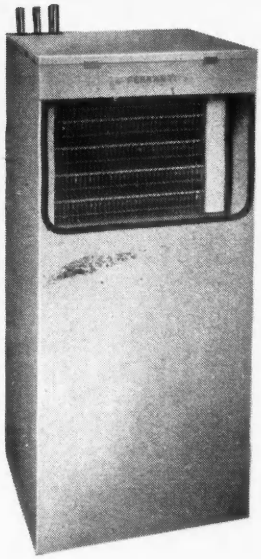
Erskine, Heap & Co., Ltd., Lancashire Switchgear Works, Salford, Manchester, 7.—**Stand 187.**—Examples of the company's switchgear and motor control gear range include switchgear up to 11 kV, 250 MVA, ASTA tested rupturing capacity; l.v. switchgear; motor control gear both of the hand-operated and contactor pattern for direct starting, star delta, auto-transformer and slip ring starting; d.c. circuit breakers; knife switches; fuses; isolating links; moving iron ammeters and voltmeters. A basic principle of the l.v. ASTA tested circuit breaker is the patented contact layout and on the 250 MVA high voltage circuit breakers the patented "direct blast" arc control device is fitted.



Falk Stadelmann contemporary design lighting fitting

English Electric domestic clothes dryer

Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick, London, W.4.—**Stand 114.**—The "Megger" insulation tester is available in four series and a new feature is that some series 1 and 2 instruments are mains operated, for the purpose of routine tests which may be of considerable duration. The "Bridge-Megger" tester combines a "Megger" insulation tester and a Wheatstone bridge for accurately measuring conductor resistances and locating cable faults by the Varley loop method. "Megger" earth testers, and a range of portable, direct-reading ohmmeters are also shown as well as indicating and recording instruments. A section is devoted to f.h.p. motors and servo motors, and a range of d.c. and a.c. sub-f.h.p. motors. Other instruments include the "Noflote" control for drainage and other pumps, and a dual-scale thickness gauge. "Evershed" cable cleats, originally produced for the company's own use, are now generally available and will accommodate cables up to 0·170in o.d.



Ferranti "Fridge-Heater"

Falk, Stadelmann & Co., Ltd., 91, Farringdon Road, London, E.C.1.—**Stand 5.**—Among the many industrial and commercial lighting fittings displayed is the "Imperial" high bay unit for use in an industrial corrosive atmosphere (housing 300/500 W tungsten or 400 W m.v. lamps) and the 200 W "Winston" tungsten fitting for lower mounting heights. In the fluorescent range the "1580" and "2580" vapour-proof fittings have gear which is enclosed in a diecast housing. Vitreous enamelled fittings and trunking are also on view and the accessories display includes the "Surflush" range with the addition of a labour saving bracket fixing 13 and 15 A socket. A number of contemporary fittings displayed include a fitting which was awarded a place of honour in a recent international competition as the best entry submitted by a British manufacturer.

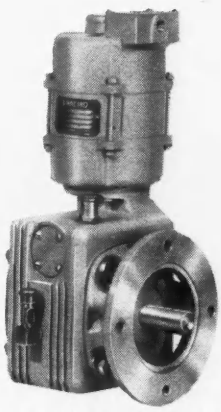
Fenton Byrn & Co., Ltd., Surbiton, Surrey.—**Stand 155.**—This manufacturer is showing a complete range of propeller type ventilating fans and convector heaters suitable for domestic, office and industrial applications. An interesting feature is the new "Air-Flow" unit kitchen canopy and fan, designed for domestic use.

Ferguson Pailin, Ltd., Higher Openshaw, Manchester, 11.—**Stand 72.**—The main exhibits comprise a 2,000 A,

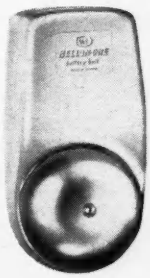
type KC7, 400/440 V, 3-phase, 4-wire, 25 MVA industrial service circuit breaker; an 11 kV, 250 MVA ring main equipment for indoor or outdoor service, containing a type OFS oil immersed fuse-switch and two type IB3 oil switches; a five-circuit miniature control board incorporating a mimic diagram with integral control and indication switches and alarms, designed to combine reliability with minimum space; and an electro-hydraulic mechanism designed for operating isolators on the 275 kV supergrid. A number of switchgear auxiliary products are also shown, including rotary control, selector and instrument switches, h.r.c. fuses and small wiring accessories.

Ferranti, Ltd., Hollinwood, Lancs.—**Stand 87.**—A three-dimensional photographic display in colour shows the transformer factory at Hollinwood and a wide range of its products includes moving coil voltage regulators and static balancers, high voltage cable testing equipment, scale models of large power, medium and distribution transformers, with a special display of a transformer with Class "H" insulation, revealing the internal construction of the core and windings. Among the house service meters is a demonstration of a high speed electronic testing set for a.c. meters, and an "FMP" a.c. prepayment meter. Indicating and industrial instruments comprise switchboard instruments, clip-on ammeters, a maximum demand alarm, a power factor relay, a portable viscometer and the "Tesvac" vacuum testing equipment. A scale model shows an electronic digital computer, built in two bays with separate control desk. Domestic appliances include radiant fires, clocks and the new "Fridge-Heater," a combined hot water heater and refrigerator, which defrosts automatically.

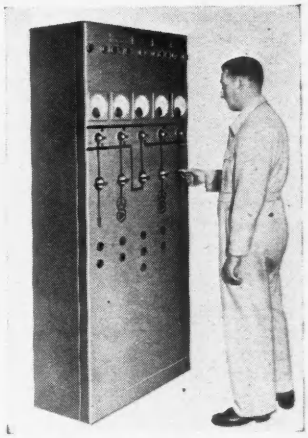
Fitzgibbon & Murray, Ltd., Lower Mill, Ewell, Surrey.—**Stand 63.**—Switch lampholders, torpedo switches, door switches, flex connectors, all types of bell pushes, candle tubes and fittings, name plate units, etc., are shown on this stand.



Fractional H.P. Motors D.91 geared motor unit



V. & E. Friedland's "Bell-in-One" battery bell



Ferguson Pailin miniature multi-circuit control panel

Foster Transformers, Ltd., London, S.W.19.—**Stand 192.**—This company is showing its mobile exhibition (see *Electrical Review*, 25th February), a complete self-contained showroom capable of displaying or demonstrating the full range of Foster products, including power transformers, outdoor voltage transformers, automatic voltage regulators, constant voltage transformers, h.v. testing equipment, instrument transformers, etc.

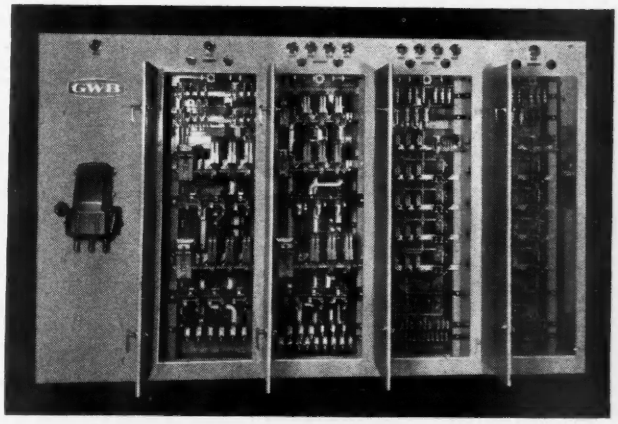
Fractional H.P. Motors, Ltd., West Heath Works, Rookery Way, Hendon, N.W.9.—**Stand 136.**—Two of the company's latest general geared motor units, the D.91 and C.70, appear among a range of a.c. and d.c. universal, shunt, split-phase, three-phase, capacitor, synchronous, and shaded pole motors, from $\frac{1}{250}$ to $\frac{1}{3}$ h.p., and geared units giving from 0·25 to 600 r.p.m., torque up to 850 lb-in.

V. & E. Friedland, Ltd., Lower Heys Mill, Macclesfield, Cheshire.—**Stand 171.**—In this exhibit of bell and chime equipment and transformer lights several new items are shown. The "Underdome" and "Masterbell" bells; the "Bell-in-One," which has its own battery box; the redesigned "Sesame" and "Dimex" push-buttons; the "Pushlite," an illuminated combined bell push and name plate; "Lightspot" and "Curveline" plastic pushes; "Master Contact" and "Desk Push" sets for use in shops, offices, etc.; among transformers, the "Surepunch," for long wiring runs; and the "Pixielite" night lamp for children.

G.W.B. Furnaces, Ltd., Elecfurn Works, Watford By-Pass, Watford, Herts.—**Stand 138.**—Three types of electrical control panels are shown, a large "tailor-made" floor mounting unit-type panel to indicate how standardization of design enables additional unit sections to be added to the initial panel, a pillar-type floor mounting panel, and a wall-mounting control panel. Attention is drawn to the range of contactors from 10 to 1,400 A a.c. or d.c. working on low voltage. They are of the air-break type and fitted with sintered tungsten-silver contact faces.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—**Stand 160.**—Motors and switchgear are among the chief exhibits. The traction motors include those specially designed for use in textile factories, oil wells, steel mills and collieries; a double-reduction geared motor for a

Left: Foster 100 kV pressure testing transformer complete with control unit



Right: Typical G.W.B. Furnaces "tailor-made" control panel

British Railways 350 h.p. standard diesel-electric shunting locomotive; a flameproof squirrel cage motor; and a 1,500 h.p., 3·3 kV, 2,950 r.p.m. squirrel cage boiler feed pump motor for power station use. A new range of interchangeable fractional h.p. motors is also shown. The switchgear consists of a new cubicle type marine group starter board, an "M.W." ironclad switchboard complete with switch fuses, fused switches and instruments; "H.W." switchgear suitable for rigorous operating conditions; some typical distribution fuseboards; a flameproof switchboard; new line contact circuit breakers; and the new domestic "D.W." switchgear.

Gent & Co., Ltd., Faraday Works, Leicester.—**Stand 38.**—Of particular interest in this exhibit of mains failure, fire and burglar alarms, industrial metalclad and domestic bells and buzzers, visual indicators, water-level control apparatus, luminous call and staff location systems, is a demonstration panel, which includes the new design of automatic fire detector and a "fire station link" for giving immediate warning at the fire station of any alarm set off at the establishment to which it is connected. On the horological side there is a master clock system with a "waiting train" movement and electronic chiming and striking equipment, a programme instrument and automatic time recorders, and a comparator dial for showing the lag/lead of frequency time to standard time, enabling corrections to be made.

Gillott Electro Appliances, Ltd., Cotswold Works, Chalford, nr. Stroud, Glos.—**Stand 193.**—Immersion and fan heaters and portable convector heaters are shown.

Gulf Oil (Gt. Britain), Ltd., 6 & 7, Grosvenor Place, London, S.W.1.—**Stand 27.**—Petroleum media include "Gulfsil" transformer, switch and other insulating oils; straight and inhibited turbine oils; meter and instrument lubricants; insulating compounds; rotating machinery greases; time lag dashpot oils; and exhibits of oil removed from service.

Harris & Sheldon (Electrical), Ltd., 31, Stafford Street, Birmingham, 4.—**Stand 118.**—The principal exhibit is the "Luve-Tile" louvre-ceiling lighting system which employs a 12in modular unit with cells approximately 2¼in each way to provide 45 deg cut-off. The use of moulded polystyrene allows the louvres to be permanently coloured. Fluorescent industrial, commercial and decorative lighting fittings and control gear are also shown.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, Kingsway, London, W.C.2.—**Stand 80.**—Among a range of fires and heaters, lamps, kettles, teamakers, food-warmers and other domestic equipment are two new products, the "Marilyn" electric fire, designed as a safety portable model for use in bathrooms, nurseries, etc., and the improved "Handymix" food mixer, now with twin beaters.

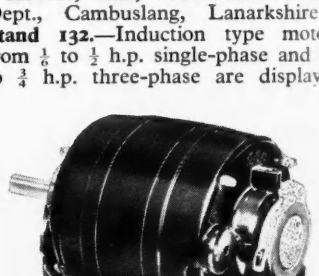
Heatovent Electric, Ltd., Lomond St., Possilpark, Glasgow.—**Stand 55.**—The company is showing space heaters for industrial and domestic services—unit heaters, convectors, "Tuvec" heaters, C.I. air warmers, radiant heaters and flameproof heaters.

Hedin, Ltd., Commerce Estate, South Woodford, London, E.18.—**Stand 217.**—Industrial heating equipment comprises band, strip, cartridge and woven elements for resistance or heating application; ovens, including a small laboratory testing unit with an oven employing forced air circulation or recirculation in the one unit; and an industrial humidity cabinet. A new addition to the exhibits is a range of radiant flexible and panel heaters.

W. T. Henley's Telegraph Works Co., Ltd., 51-53, Hatton Garden, London, E.C.1.—**Stand 31.**—Oil-filled and gas cushion cables up to 132 kV are shown with mass impregnated types up to 33 kV, and the latest types of fully impregnated non-draining cables and aluminium sheathed cables. Samples of cable for power stations, distribution, mining and other industrial requirements are accompanied by general-purpose cables, among which are metallic flexible armoured cables. Wiring systems include junction boxes and fittings. The Henley rising main system for multi-storey buildings is another prominent feature. Distribution equipment includes joint, terminal and service boxes and distribution panels with isolating switch assemblies. Service fuses, consumers' control units, earth-leakage circuit breakers, jointing and overhead accessories are among the smaller exhibits. Photographic enlargements depicting recent e.h.v. cable installations and overhead line contracts represent the activities of the Contract Department.

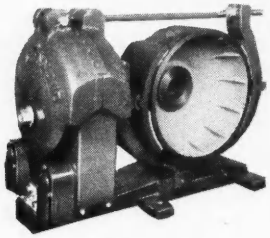
Holophane, Ltd., Elverton Street, Westminster, London, S.W.1.—**Stand 74.**—Lighting in industry, commerce and public service is the theme of this display. Bulkhead fittings include a new circular recessed unit for interior or exterior application and a "Side-of-House" lantern for use with 150/200 W g.l.s. lamps, which although primarily developed for Group "B" street lighting installations, is also suitable for lighting in industrial plants. A high bay heavy duty fitting used in conjunction with the 1,000 W MB/U mercury discharge lamp and two general purpose reflector units with ventilated canopies for 3,000 W and 500 W g.l.s. lamps, providing intensive type light distribution with an upward component for low bay lighting, are also shown. Commercial fittings are represented by the "Inbilt Controlens" and "Lentilite" units, which employ prismatic lens plates and the "Steplite" series, and flameproof lighting units for oil refineries and chemical works, industrial translucent units and other fittings complete this extensive range.

Hoover, Ltd., Industrial Products Dept., Cambuslang, Lanarkshire.—**Stand 132.**—Induction type motors from $\frac{1}{6}$ to $\frac{1}{2}$ h.p. single-phase and up to $\frac{3}{4}$ h.p. three-phase are displayed

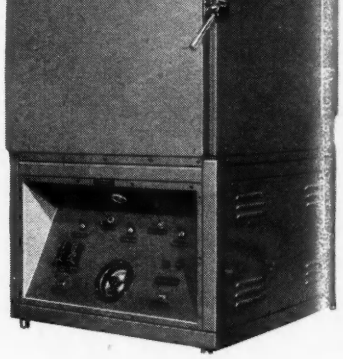


G.E.C. resiliently mounted split phase start f.h.p. motor

Hoover shaded pole motor for large fan application

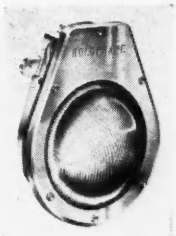


Igranic "SM" brake

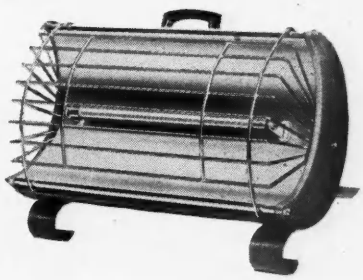


Hedin forced air circulation oven

Bank of Hunt 400 kVAr capacitors for electrical furnace work



Holophane "Side of House" lantern for narrow streets



Hawkins "Marilyn" electric fire

together with complete geared units, powered by Hoover motors and made by David Brown Gears (London), Ltd., and S. E. Opperman, Ltd. Stator-rotor units shown cover $1\frac{1}{2}$ to $\frac{1}{2}$ h.p. and are both split-phase and capacitor start types for hermetic refrigeration. A new shaded pole range of 4- and 6-pole motors have large diameter oil impregnated sleeve bearings and are suitable for special applications, notably drive fans, etc. Moulded commutators are of the broached type of from $\frac{1}{4}$ to $1\frac{1}{4}$in dia, 7-40 bars and of the extruded type of from $\frac{1}{4}$ to 1in dia, 7-20 bars.

Hotpoint Electric Appliance Co., Ltd., Fletton, Peterborough.—**Stand 157.**—A range of domestic appliances includes rotary and table ironers, clothes dryers, vacuum cleaners, fans, refrigerators, irons, bed warmers, percolators, toasters, fires, kettles, warming plates, etc. The "CH/P" washing machine now incorporates a 3 kW heater and this is shown for the first time. Also on view is a range of immersion heaters, thermostats and lagging jackets.

V. G. Howell & Co., Ltd., Crown Street, Wolverhampton.—**Stand 68.**—Industrial control equipment comprising controllers, grid and tubular type resistances and contactors, the "Auto-cam-tactor" system of controlled acceleration, a.c. and d.c. motor control, change-over contactors, double- and single-pole d.c. contactors, fixed and sliding tubular resistors, limit switches, etc., are shown. New products include grid resistances, four point suspension and double tiebar construction and master control switch.

A. H. Hunt (Capacitors), Ltd., Bendon Valley, Garratt Lane, Wandsworth, London, S.W.18.—**Stand 222.**—Capacitors for radio, electronic and electrical industrial applications include power factor improvement, phase splitting, motor starting and running, fluorescent lighting, h.f. and r.f. heating, radio transmission, telephone installations, and ignition and interference suppression types. A new product of interest is a miniature oil-filled aluminium cased capacitor for fluorescent lighting and other applications.

Igranic Electric Co., Ltd., Bedford.—**Stand 58.**—Visitors to this stand will see many different types of master switches, limit switches, pressure switches, float switches, speed responsive switches, push-buttons and l.v. lighting units, together with typical examples of the wide range of Igranic standard starters and relays. Demonstration items include solenoids and electro-dynamic plugging relays. One interesting exhibit is the new type "SM" brake, which conforms to the A.I.S.E. requirements for brakes having standard wheels and fixing positions for use with the new 600 range of mill motors.

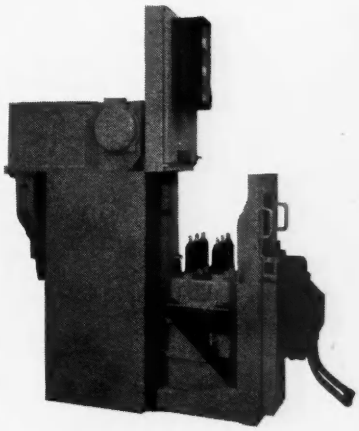
Imperial Chemical Industries, Ltd., Millbank, London, S.W.1.—**Stand 213.**—The Nobel Division is exhibiting silicone fluids, resins and rubbers. The properties of silicones which commend them to the electrical industry are displayed in a series of working models, demonstrating resistance to high and low temperature and to ozone, water repellency and foam suppression. One model shows how silicone rubber retains its elasticity in a bath of "Drikold" at 70 deg C, and in an electric furnace at 200 deg C. A transformer operating under water and an electric motor running at a temperature at which conventional insulation would fail demonstrate Class H insulation. Silicone rubber mouldings and cable coverings and silicone resin and rubber coated glass cloth are also being shown.

Jeary Electrical Co., Ltd., 324, Old Street, London, E.C.1.—**Stand 179.**—Among industrial electrical equipment exhibited are propeller and axial flow fans from 9in to 36in including flameproof types, a new range of small geared motors in universal and permanent capacitor units from $\frac{1}{10}$ h.p. to $\frac{1}{15}$ h.p., small centrifugal blowers, and switch and motor control gear.

Richard Johnson & Nephew, Ltd., Forge Lane, Manchester, 11.—**Stand 133.**—This range of products comprises copper wire, strip and stranded conductors.

Johnson & Phillips, Ltd., Charlton, London, S.E.7.—**Stand 108.**—Examples of transformers, capacitors, switchgear and power cables are shown. One exhibit of particular interest is a comparison in weight, size and performance between a 100 kVA transformer with hot rolled steel laminations and another for 150 kVA with cold rolled steel laminations. The cold rolled steel has an iron loss 15 per cent lower than that of the hot rolled steel. The range of switchgear includes h.v. units up to 11 kV; l.v. industrial type switchgear, including the DB 20 oil circuit breaker, with a display showing the use of a pole mounting "D" fuse switch in which a portion of a single-phase overhead line is reproduced; the FG 16 switchgear unit with ratings up to 250 MVA at 11 kV; the L4 oil circuit breaker; a unit certified for 37·5 MVA at 600 V and 30 MVA at 400 V; the FS metalclad fuse-switch, an oil switch backed up by h.r.c. fuses, providing an economical means of control; and the "TOS Trinal" oil switch. A capacitor of 333 kVAr output is also shown, together with a 60 kVAr capacitor and the cable display includes both power and wiring cables and joint boxes.

Kent Bros. Electric Wire Co. & E. H. Phillips, Ltd., Kew Works, Broad Lane, Bracknell, Berks.—**Stand 85.**—Exhibits include high conductivity



Typical Johnson & Phillips switchgear unit

copper winding wires and strips insulated with cotton, paper, silk, rayon and enamel.

James Kilpatrick & Son, Ltd., Kelvin House, River Cart Walk, Paisley.—**Stand 16.**—These contractors are exhibiting collective information on a complete electrical service at home and overseas. Also shown is an example of an illuminated ceiling.

Klaxon, Ltd., Warwick Road, Tyseley, Birmingham.—**Stand 83.**—Industrial motor driven hooters and sirens, fractional horse-power motors and geared motor units are on show. The EM-MR1 geared unit incorporates a worm and multi spur reduction gearbox and is available with gear ratios up to 11,429:1. It can incorporate series, shunt, compound, capacitor, shaded pole, squirrel cage or synchronous winding.

Lancashire Dynamo & Crypto, Ltd., Trafford Park, Manchester, 17.—**Stand 57.**—This company will show its new range of Anglo-American motors which have interchangeable outputs and dimensions for both protected and totally enclosed fan-cooled enclosures. The 50 c/s motors have interchangeable outputs and dimensions with new N.E.M.A. (United States) and C.E.M.A. (Canada) protected and totally enclosed fan-cooled 60 c/s motors. Other exhibits include a 2,000 h.p., 2,980 r.p.m. "Silentvent" motor, a "Corcooled" flameproof motor and electromagnetic brakes, as applied to geared motor units.

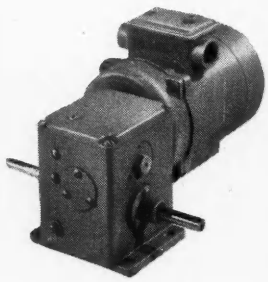
Langley London, Ltd., Kelvin Way, Crawley, Sussex.—**Stand 152.**—Here there will be a complete range of electrical insulation materials, as well as a wide range of piece parts manufactured from silicone bonded glass fabric in tube, moulded and sheet form.

Lewden Metal Products, Ltd., 5, Argall Avenue, Lea Bridge Factory Estate, London, E.10.—**Stand 165.**—The exhibit consists mainly of weather-tight fittings including switches up to three gang, 5 and 15 A, cable couplings in all standard gauges, with 3, 4 or 5 pins and a full range of interlocking and non-interlocking switch plugs. Other items include a full range of hooks and hook plates, weather-tight packing glands, bonding nipples, flexible tubing adaptors, switch units up to 8 gang and 5 and 15 A switch plugs.

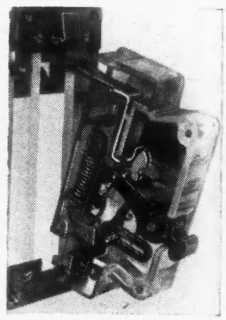
Linolite, Ltd., 118, Baker Street, London, W.1.—**Stand 176.**—This company's exhibits comprise a wide range of decorative lighting fittings, strip reflectors, and signs for both domestic and commercial use.

Londex, Ltd., Anerley Works, 207, Anerley Road, London, S.E.20.—**Stand 48.**—Among the new relays being shown is a midget relay with moulded base, insulators and screw terminals, a calibrated sensitive relay, sealed coaxial relays, and starter relays with auxiliary contacts. New process

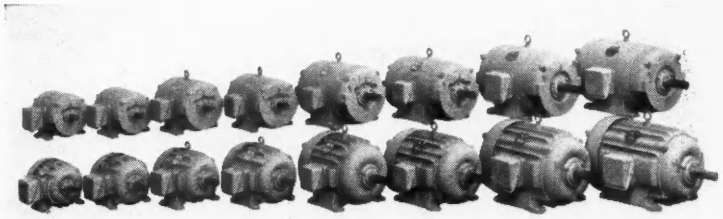
William McGeoch 15/25 A 500 V 6-pin watertight plug and socket



Klaxon EM-MF1 geared unit incorporating worm and multi-spur reduction gear box



M.C.B. Co.'s "Lupus" miniature circuit breaker



Lancashire Dynamo & Crypto's A.A. range of motors

and interval timers include a compact unit for flush mounting on control panels; it can be supplied to meet all recognized switching actions, the shortest time range being 10 sec and the longest 72 hr. Other exhibits include electro-magnetic and electronic counters, photo-electric control apparatus, and automatic power factor correction gear.

London Electric Wire Co. & Smiths, Ltd., 24, Queen Anne's Gate, London, S.W.1.—**Stand 26.**—This company and its associated companies, Frederick Smith & Co., the Liverpool Electric Cable Co., Ltd., and Vactite Wire Co., Ltd., are showing a comprehensive range of bare and insulated conductors for all purposes. These include winding wires and strips, bare copper and copper alloy conductors, rubber, thermoplastic, paper and cambric insulated cables and flexibles, resistance wires and tapes and molybdenum rods, wires and tapes.

London Electrical Co. (Blackfriars), Ltd., Blackfriars Road, London, S.E.1.—**Stand 126.**—This firm of wholesalers is showing a variety of industrial and specialized equipment including asbestos cables, busbar chambers, cable trays, cable trunking, conduit benders, time switches, striplighting, space heating, exhaust fans, insulating paints and varnishes and conduit and conduit fittings.

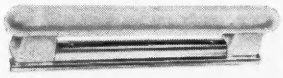
Longlamps, Ltd., 24, Marshalsea Road, London, S.E.1.—**Stand 172.**—Tubular architectural lamps and fittings and fluorescent lamps, fittings and control gear.

M. & J. Lossos & Co., Ltd., 31, Beethoven Street, London, W.10.—**Stand 220.**—Restyled "Kaloric" electric convectors and unit heaters are available with loadings of 750 W and 1, 2 and 3 kW with or without built-in thermostat or switch control. Unit heaters of 3 kW and from 4 to 20 kW are also shown.

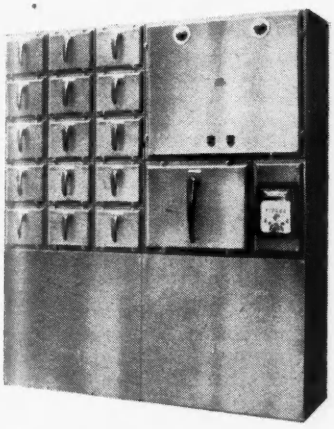
W. Lucy & Co., Ltd., Eagle Ironworks, Oxford.—**Stand 156.**—Besides a selection of h.v. and l.v. switch and fuse-gear, and transmission and distribution equipment, there is a complete outdoor substation comprising h.v. oil-switch and l.v. network protector. Also shown is a range of ring main and fuse-switch units, both of the extensible and non-extensible types, with tested capacities of 250 MVA and 6·6 and 11 kV. The l.v. section embodies substation distribution boards both of the open and enclosed types, substation and distribution pillars, air circuit breakers, disconnecting boxes, maximum demand indicators, current transformers and instrument switches. Among the industrial switch and fusegear is the Mark III panel type fuse-switch.

Luxram Electric, Ltd., 53, Gt. Eastern Street, London, E.C.2.—**Stand 194.**—Electric lamps for both general and special purposes are to be seen alongside machinery for the manufacture of standard and miniature lamps, fluorescent tubes and cathode ray tubes.

M. & C. Switchgear, Ltd., Kelvinside Works, Kirkintilloch, Glasgow.—**Stand 102.**—On this stand is a range of medium voltage a.c. motor control and distribution gear designed for service in industries where reliable operation, maximum flexibility and speedy multi-unit assembly are essential. Direct-on starter units are



Linolite MSK lighting fitting



Lucy Mark III panel mounting fuse switch

available from f.h.p. to 200 h.p. and embrace only six frame sizes. Other units available for building into board formation include oil-immersed circuit breakers up to 1,600 A, distribution units from 30 to 450 A, busbar coupling switches, air-break or oil-break up to 1,600 A, and transformer and metering units. D444 cubicle type motor control and distribution gear for heavy industrial service is also being shown, together with a varied selection of push-button switches, oil-break switchgear, contactor starters and sequence control for conveyors.

M.C.B. Co. (Manchester), Ltd., 6, Melrose Avenue, Brooklands, Sale, Manchester.—**Stand 17.**—The exhibits comprise a new range of "Lupus" miniature circuit breakers of simplified design, which are primarily intended for distribution work. Breakers are provided with universal cable terminals, suitable for front or back entry, or, alternatively, with plug-in terminals for distribution boards, permitting isolation without supply interruption. Other features of the breaker are reduced size, magnetically assisted thermal protection, self-contained arc-chamber, arc tips integral with the main contacts and a completely sealed mechanism.

M.K. Electric, Ltd., Wakefield Street, London, N.18.—**Stand 56.**—The whole range of "MK" wiring accessories is on view, comprising designs for both domestic and industrial users. Of the three important new additions, the flush grid-switch range is for installations where quality is of first consideration. The switches are on removable grids for easy mounting and the range is made up of a series of interchangeable units for versatility and easy stocking. Another addition is a range of industrial switches designed on the same principles which are available with up to eight gangs. The third new range is an addition to the "Plate-switch" series for contractors who prefer units to fit plaster-depth boxes.

M.T.E. Control Gear, Ltd., Leigh-on-Sea, Essex.—**Stand 36.**—Typical examples of automatic control panels for various industrial applications cover machine tools, refrigeration plant, printing machinery, etc. Other items include a.c. and d.c. air-break contactors, timing devices, over-current relays, control circuit relays and push-button stations, and automatic starters. The new "Vari-Drive" variable speed control equipment is demonstrated in the "Motor Way."

W. McGeoch & Co., Ltd., Warwick Works, 46, Coventry Road, Birmingham, 10.—**Stand 46.**—Open type knife switches rated up to 10,000 A are shown, together with back-of-board switches and fusegear with ratings up to 400 A including high current slow-break units, as used in the manufacture of switchboards. A 27·5 kVA control panel suitable for use in connection with diesel generators is shown alongside mounting boxes for metering and recording instruments. Other exhibits include watertight sockets and plugs, switches and couplings, indicator light units, lighting fittings and electrical accessories suitable for industrial and ships' use.

Robert MacLaren & Co., Ltd., Eglinton Works, Kilbirnie Street, Glasgow, C.5.—**Stand 131.**—The main exhibit is the new and inexpensive type "MB" thermostat.

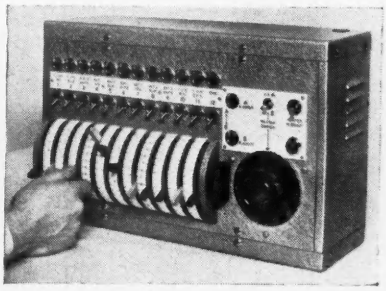
Major Equipment Co., Ltd., 22, Gorst Road, London, N.W.10.—**Stand 201.**—This company is showing a 12-way control panel for a saturable reactor dimmer board. Constructed in chassis form, it is capable of easy extension in both vertical and horizontal directions and can be either wall or desk mounted and circuits can be individually controlled or switched to a group master for collective dimming; multi-group panels can be coupled to a single grand-master control. Other exhibits include "Multi" fluorescent fittings in a variety of designs.

Mantel Metalworkers, Ltd., 121, Gurney Street, London, S.E.17.—**Stand 190.**—The "Zedlok" consumers' supply control units, cable trunking and busbar chambers are shown, special attention being directed to the rising main system which was introduced last year.

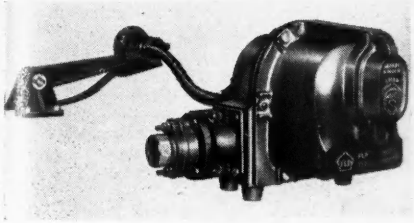
Marryat & Place, Ltd., 40, Hatton Garden, London, E.C.1.—**Stand 130.**—The "Barduct" distribution system is being shown complete with a full range of accessories. The trunking is available in current ratings of 150 or 250 A, in two-, three- or four-pole types. Tappings are made by plug-in tapping boxes, rated from 20 to 100 A. Angle and tee fittings enable the trunking run to be laid out to the best advantage. Other exhibits include heavy open and steelclad busbars having current ratings up to more than 20,000 A.

Martindale Electric Co., Ltd., Westmorland Road, London, N.W.9.—**Stand 1.**—This company is showing an attractively designed industrial vacuum cleaner with two motors which may be used singly or together. Another exhibit is the "Vibrovertor" which enables cold cathode lighting to be used in vehicles from 24 V batteries. Other exhibits include a taping machine, together with a range of panels carrying

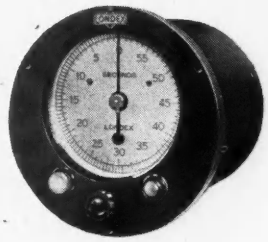
Martindale model 120 industrial cleaner



12-way control panel for a "Major" saturable reactor dimmer board



M. & C. Switchgear "Sentryfugue" switch for sequence control



Londex RFT process timer

blowers and heating attachments, etchers, dust masks and industrial gloves, "Commstones" and grinding tools, sprayers and undercutters and handpieces.

Measuring Instruments (Pullin), Ltd., Electrin Works, Winchester Street, London, W.3.—**Stand 2.**—Switchboard panel mounting, portable and laboratory standard electrical indicating instruments, multi-range test sets, relays, electronic and electro-mechanical test gear are among the equipment shown. A recent development is the "E.H.T." probe which has been designed for voltage detection and measurement and has a wide field of application in radar, television and similar equipment utilizing high voltages. Also displayed is the Pullin range of "S" relays.

Mersey Cable Works, Ltd., Linacre Lane, Bootle, Liverpool, 20.—**Stand 51.**—Here there is a comprehensive selection of rubber, thermoplastic and varnished cambric insulated wires, cables and flexibles for all purposes, together with improved glands and joint boxes.

Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, 17.—**Stand 159.**—On the heavy equipment side this company is showing two models—one of a hydrogen-cooled generator and the other of a 138 MW water-wheel generator. Motors include a 45 h.p., 1,470 r.p.m. flameproof squirrel-cage machine developed for the National Coal Board for driving Lobbe Hobel coal ploughs and Panzer conveyors, a 30 h.p., 8-pole high-torque splashproof squirrel-cage motor to American N.E.M.A. standards, and a specially designed squirrel-cage motor for use with tape recorders. The switchgear exhibit will be a type "LG1" 33 kV outdoor oil circuit breaker with a breaking capacity up to 750 MVA. The control gear exhibits will include various types of starters and control stations, together with a photo-electric relay and an electronic timer. The company's lighter products are represented by a meter display, various types of industrial and cooking heaters, together with a wide variety of lighting fittings.

Metway Electrical Industries, Ltd., Metway Works, Canning Street, Kemp Town, Brighton, 7.—**Stand 9.**—There is a comprehensive display of domestic elements and spirals, industrial elements, conduit fittings and wiring accessories, porcelain accessories, industrial lighting fittings, and sliding dimmers. Domestic appliances include the "Miniway" 2-pint kettle, the "Miniway De Luxe," which is an automatic version of the former, and a 3-pint kettle with a loading of 2,000 W.

Midland Electric Manufacturing Co., Ltd., Tyseley, Birmingham, 11.—**Stand 125.**—This company is showing a comprehensive range of equipment including busbar chambers, switchgear and fuseboards, isolators and motor control gear. Several control panels showing "Autoline" and "Auto-Memota" demonstrate the behaviour of the starters and their protective features under operating conditions. Other exhibits include plugs and sockets, l.v. lighting equipment, fires and convectors.

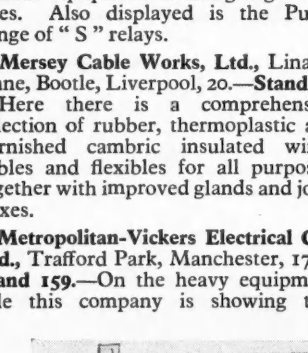
Midland Silicones, Ltd., 19, Upper Brook Street, London, W.1.—**Stand 92.**—Silicones are shown in the forms of resins, elastomers, varnishes, compounds, greases and fluids and in combination with glass, mica and asbestos. Woven glass cloth coated with silicone varnish and motors with class H insulation which have been similarly impregnated are also on view. "Silastomer" is shown in many forms including moulded and extruded components, as an insulant for cables, wires and flexibles, as insulating sleeving and as a coating for glasscloth sheeting and tapes.

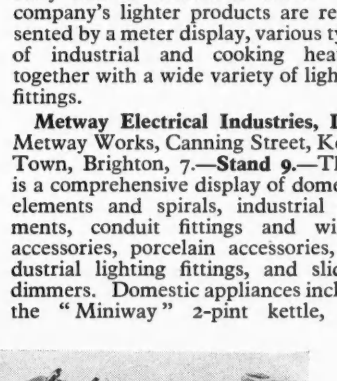
Modern Telephones (Great Britain), Ltd., Telesound House, 101, Tottenham Court Road, London, W.1.—**Stands 106/194A.**—Exhibits come under three headings, Group I being push-button intercommunication telephone systems with or without loudspeaking executive master stations; Group II, "Moderncom" electronic amplified loudspeaking flexible systems as designed for the United States and Canada in collaboration with Radio Corporation of America; and Group III, private automatic exchanges from "baby" 10/1 switchboards to 10,000 lines. Among the new products is a push-button telephone system (maximum 11 points) operating by long-line connection to a P.A.X., "Moderncom" electronic amplified nurse call system for hospitals, etc., and various new electronic developments.

Nalder Bros. & Thompson, Ltd., Dalston Lane Works, London, E.8.—**Stand 107.**—On the company's stand are to be seen ammeters, voltmeters, wattmeters, power factor meters, frequency meters, reactive meters, kVA meters, vectormeters, synchroscopes, phase rotation indicators, multi-test sets and multi-flag indicators and also mining flameproof instruments, hermetically sealed instruments and a selection of portable industrial and precision instruments for workshop and laboratory use. Other items include a range of graphic chart recording instruments and a selection of relays. An earth proving supply point switch is also demonstrated for use with portable electric tools.

Nettle Accessories, Ltd., Harper Road, Wythenshawe, Manchester.—**Stand 147.**—Moulded electrical accessories include a full range of 13 A ring

Exploded view of the M.E.M. "Autoline" starter designed for Canadian market





Above: Nife steel-clad tripping unit incorporating steel alkaline storage battery

Left: Metropolitan-Vickers LG1 circuit breaker with tank lowered

main sockets and switch sockets, ceiling roses, Edison screw and b.c. batten holders and lampholders, a.c. switches, architectural fittings, inspection handlamps, cable couplers and rubberclad sockets and plugs. Among new products are a range of 5 A a.c. microgap switch units, 13 A 3-pin moulded rubber plug tops, an industrial handlamp and a semi-recessed 13 A plaster depth socket unit.

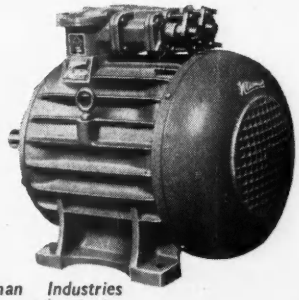
New Day Electrical Accessories, Ltd., 136-8, Mary Street, Balsall Heath, Birmingham, 12. — **Stand 193.** — Tumbler switches, multi-gang units, pilot control units, ring main sockets and the "Fireside" triple socket are on show together with the new 15 A "Micro" limit switch.

Newman Industries, Ltd., Yate, Bristol.—**Stand 196.**—Emphasis is on the flameproof motor range, including both naturally and fan-cooled models, and a special display shows one of the larger fan-cooled flameproof motors quarter-sectioned and arranged to run. Other individual exhibits and display panels illustrate the form of construction and materials used. A new series of vertical pump motors in prototype shows that these are of both solid and hollow shaft types and available as totally enclosed or drip-proof models. Ranging from 1½ to 125 h.p., they are designed primarily for deep well turbine pump applications.

Nife Batteries, Ltd., Redditch, Worcs.—**Stand 167.**—Prominent in a group of battery-operated equipment are a "Nife-Neverfayle" minor emergency lighting set, one of a wide range catering for all conditions in all types of building; a self-contained switch-tripping unit; and a selection of lighting equipment ranging from cap lamps to portable searchlights.

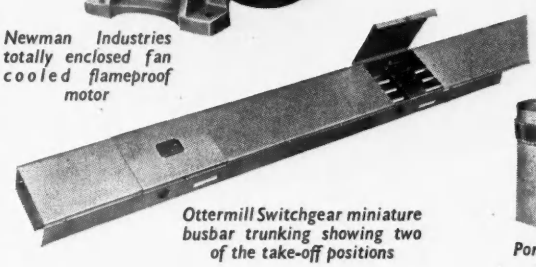
Oldham & Son, Ltd., Denton, nr. Manchester.—**Stand 53.**—The latest series of safety handlamps include the "GW" and the "GW-H" cap lamp, the "Tanka II" inspection lamp, the "Shunter's" lamp, the "Tuba" torch, the "Tanka IIR" (explosives magazine lamp) and the W.S.M. lamp. Emergency lighting units and the Oldham shaft signalling unit designed for use with colliery winders are also being shown, with the latest developments in traction and stationary batteries.

Ottermill Switchgear, Ltd., 1, Victoria Street, London, S.W.1.—**Stand 216.**—Miniature busbar trunking which has been specially designed for 100 A rating and can be economically used for installations as small as 50 A makes its appearance for the first time. Tapping positions are provided at 2ft intervals along the trunking and connections can be made in a matter of minutes. Each position is fully furnished and can be made alive by the insertion of h.r.c. fuse carriers. Fused tapping boxes and additional equipment are not required. Other equipment includes switchboards, oil circuit breakers, fused switches, lightweight busbar chambers, cable trunking and moulded h.r.c. fuse units. A ring main, fitted with tapping boxes and incoming units, encircles the stand.



Newman Industries totally enclosed fan cooled flameproof motor

Circular scale ammeter with platform scale (Nalder Bros. & Thompson)



Ottermill Switchgear miniature busbar trunking showing two of the take-off positions

Portaway "Fulgrip" bonding clamp

Parmiter, Hope & Sugden, Ltd., Longsight, Manchester, 12.—**Stand 112.**—Being shown for the first time is a cabinet-style distribution board equipped with "Aeroflex" rewirable h.r.c. cartridge fuse-links in 15 or 30 A ratings and available for s.p. and neutral, d.p., triple-pole, triple-pole and neutral and phase splitter requirements and from four to twelve ways. The new range of rewirable "energy limiting" fuses types "AD" and "FC" conform fully to B.S. 88 class P and have category 5 breaking capacity, equivalent to 35 MVA. Further exhibits include metalclad unit type fuse switchboards showing circuits from 30 to 600 A and metalclad fuse distribution boards as well as a flameproof type of welded construction. There is also a special display featuring the history of fuses from 1905 to 1955.

Partridge Transformers, Ltd., Roebuck Road, Tolworth, Surrey.—**Stand 178.**—The company is exhibiting a new range of portable and wall-mounted l.v. transformers covering outputs from 25 VA to 5 kVA, transformers up to 100 kVA, X-ray and h.v. testing transformers, furnace transformers up to 5,000 A, audio-frequency transformers and d.c. smoothing chokes.

Partridge, Wilson & Co., Ltd., Evington Valley Road, Leicester.—**Stand 66.**—On this stand are to be seen rectifying equipments of every type up to a rating of 100 kW for electroplating and battery charging, and stationary batteries for cathodic protection and the feeding of d.c. motors. Transformers from 5 VA up to 500 kVA designed for industrial applications are also on view, including transformers for electric furnaces, l.v. hand tools and lighting, rectifiers and electronic gear, etc.

Permanoid, Ltd., Vincent Works, New Islington, Manchester, 4.—**Stand 223.**—Light power flexibles include the new "Permathene" diolpated p.v.c./polythene surface wiring cables, "Permanoid" fully flexible connecting leads for all small powered equipment and "Permanoid" VO flexibles, wires and sleevings for use in leads from motors and transformers and all electronic equipment.

Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.—**Stands 19 & 177.**—The main theme is the Philips trunking system, with an actual installation down each side of the stand. New fittings for the "Gear-Less" fluorescent lighting system are on view, together with internal reflector lamps and the new 400 W mercury fluorescent lamp. Sodium lamps and floodlights, fluorescent fittings and a variety of special fittings are displayed.

The Instrument Department (Stand 177) exhibits a range of variable transformers, a power station recorder and a working a.c. stabilizer. The 2·5 induction heating equipment (Electronic Heating Department) is seen working and the "Tempomat" resistance welding control equipment is also being demonstrated.

Pinnes Electrical Products (N. Pinnes, Ltd.), 218, City Road, London, E.C.1.—**Stand 79.**—Industrial and domestic fluorescent lighting fittings are displayed. Fully guaranteed for two years, each fitting is corrected and fitted with radio interference suppressor.

Porter Electrical Products, Ltd., 11, Kings Road, Bramhope, Leeds.—**Stand 33.**—Among a display of earthing equipment is the new "Fulgrip" bonding clamp assembly for bonding "Portaway" conductor to large diameter pipes, ducts, etc., and the "Dyrod" earth electrode.

Power Centre Co., Ltd., Lloyd Street, Wednesbury, Staffs.—**Stand 215.**—The display of industrial distribution gear comprises busbar and cable trunking, a cable-tap system, rising

main systems, fuse units, fuseboards, switch-fuses, busbar chambers, switchboards, cable boxes and accessories. Of particular interest is the 100 A miniature busbar trunking, incorporating all-insulated busbars and tap-off points at 2ft centres and 15 and 30 A fixed-type fuse boxes. The same design of busbar trunking can also be adopted for larger current ratings.

Pritchett & Gold & E.P.S. Co., Ltd., 137, Victoria Street, London, S.W.1.—**Stand 127.**—A typical P. & G. automatic emergency lighting set is housed in a sheet steel cubicle. It includes an associated battery of 14 P. & G. Planté type closed top cells. Other examples of this type of cell are included in a representative selection of stationary batteries produced for all modern d.c. duties associated with the generation, distribution and application of electricity.

Pyrotenax, Ltd., 7, Victoria Street, London, S.W.1.—**Stand 37.**—Displayed here are mineral insulated cables for power and lighting installations, mineral insulated cables for earthed concentric wiring, m.i.c.c. cables for use as catenary wiring and m.i.c.c. heating cables.

Radio Heaters, Ltd., Eastheath Avenue, Wokingham, Berks.—**Stand 50.**—An electronic forge is a 6 kW induction heating unit of rugged design for general workshop soldering, brazing and heat treatment. A new 5 lb low-cost induction melting furnace is being demonstrated.

Ranton & Co., Ltd., "Rock Works," Commerce Road, Brentford, Middlesex.—**Stand 166.**—"Rock" electrical accessories and general mouldings for all trades are being shown.

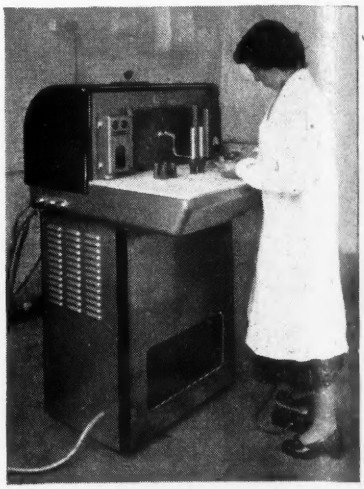
Rawlplug Co., Ltd., Rawlplug House, Cromwell Road, London, S.W.7.—**Stand 184.**—This comprehensive display of fixing devices for all manner of electrical equipment includes the "Rawlnut" which consists of a rubber bush into which is fitted a tapped metal insert. In action the tightening of the screw pulls the metal insert forward and bulges the surplus rubber outwards until it forms a firm "washer" on the reverse side of the material.

Record Electrical Co., Ltd., Broadheath, Altrincham, Cheshire.—**Stand 93.**—This display of instruments includes the "Cirscale" range in which the scale length is twice the dial diameter. The latest addition is the series "A," which covers a full range of a.c. and d.c. instruments having 3.5in dials and 240 deg scales, platform dials, square flush mounting flanges and are extremely rugged in construction. There are also recording instruments and relays among the other exhibits.

Revo Electric Co., Ltd., Tipton, Staffs.—**Stand 163.**—The display is divided into four sections comprising cookers and domestic appliances, including the "Monarch" cooker; switchgear and fans; industrial lighting fittings, wellglass fittings, bulkhead and floodlight units; and street lighting equipment. A new consumers' service unit is seen for the first time.

A. Reyrolle & Co., Ltd., Hebburn, Co. Durham.—**Stand 18.**—A representative range of industrial and distribution switchgear for up to 33 kV and of "CH" variable speed a.c. commutator motors is staged. The switchgear includes an outdoor 33 kV, 500 MVA oil-break circuit breaker with three phases in one tank operated by a motor-charged spring-closing mechanism. A 440 V, 1,600 A, 25 MVA air-break circuit breaker with air-insulated back part is coupled up to a distribution switch and fuseboard with 2,000 A busbar chambers. A similar distribution board of flameproof construction incorporates a 10 A double-circuit flameproof motor-starting contactor panel.

Rheostatic Co., Ltd., Slough, Bucks.—**Stand 146.**—A new electric water heater control is on show but details were not available in advance. Water heater controls, "Satchwell" thermostats for electric cookers, "Q" thermostats, horticultural controls and a representative selection of temperature controls for industrial processes and air conditioning are also displayed.



Radio Heaters 6 kW electronic forge

Rolls Switches, Ltd., 154/6, Blackfriars Road, London, S.E.1.—**Stand 89.**—Exhibits include 5 A round surface, flush and gang types, and surface iron-clad switches.

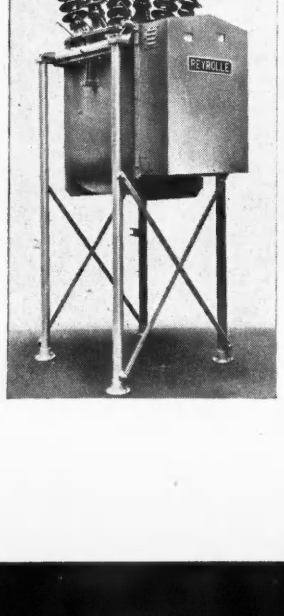
Wm. Sanders & Co., (Wednesbury), Ltd., Falcon Electrical Works, Wednesbury.—**Stand 77.**—In addition to light, medium and heavy duty switch and fuse gear and the usual range of accessories, further developments in fuse switches are indicated.

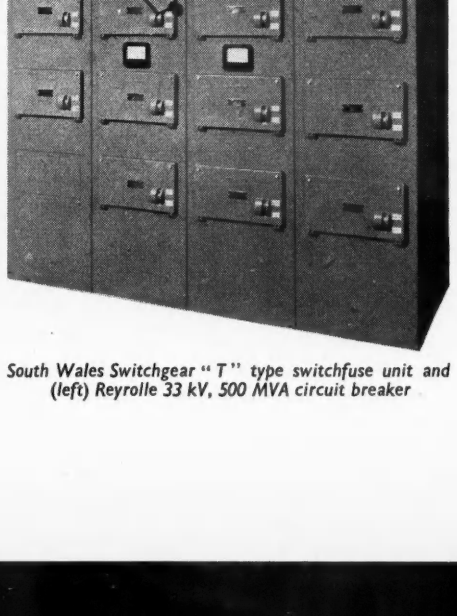
Santon, Ltd., Somerton Works, Newport, Mon.—**Stand 140.**—The new "Monmouth" dual purpose thermal storage water heater has two heaters incorporating fixed setting thermostats and a short 3 kW heater to provide small quantities of water at 140 deg F, for sink and normal culinary purposes. The depth heater also has a loading of 3 kW and can have a fixed setting thermostat set at 180 deg F.

George H. Scholes & Co., Ltd., Wylex Works, Wythenshawe, Manchester.—**Stand 96.**—Here may be seen the "Wylex" dual plug system for ring main and non-ring main wiring as well as a wide range of small switch and fuse gear. There are also examples of "Wylex" and "Sonex" cooker control units.

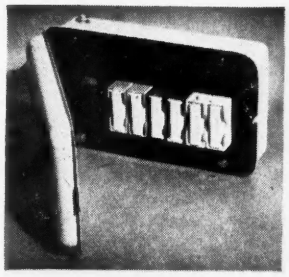
Scottish Cables, Ltd., Deanside, Renfrew.—**Stand 62.**—A representative range of the company's products includes domestic cables and flexibles, and a display unit illustrates the applications of the larger power cables. There is also a sectionalized model of a 33 kV joint and uses of "Renex" anti-corrosion protection are shown.

Siemens Electric Lamps & Supplies, Ltd., 38-39, Upper Thames Street, London, E.C.4.—**Stand 198.**—A representative selection of the company's products includes cables, telephone equipment, switch and fuse gear, lamps

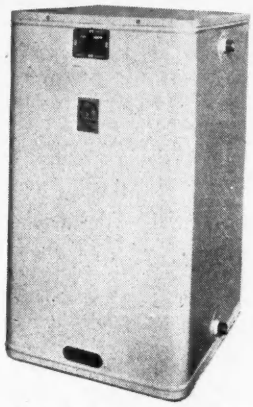




South Wales Switchgear "T" type switchfuse unit and (left) Reyrolle 33 kV, 500 MVA circuit breaker



Revo consumers' service unit



Santon "Monmouth" dual purpose thermal storage water heater

and lighting fittings, street lighting equipment and photographic electronic flash tubes. The "Kuwait" fluorescent street lighting lantern is now available on the home market.

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.—**Stand 88.**—Switchgear exhibits include a heavy duty industrial free-standing 25 MVA switchboard. The "Regent" units incorporated in this assembly are A.S.T.A. certified for 35 MVA and comply in every respect with current specifications. The adaptability of the "Regent" busbar chamber is illustrated by a free-standing exhibit incorporating every known type of busbar connection, and this adaptability is depicted by a wall-mounting panel, and the complete assembly of a "Regent" 60 A switch-fuse directly coupled to one of the new "Regent" 15 A t.p. fuseboards. Accessories, lighting fittings, flameproof switchgear and other equipment and "Creda" domestic apparatus are also included.

H. C. Slingsby, Ltd., 89, Kingsway, London, W.C.2.—**Stand 153.**—In addition to the usual wide range of handling equipment, there is shown the recently introduced large "Slingsby-Verrolec" machine mover skate designed to carry a load of up to 130 tons.

Slough Metals, Ltd., Oxford Avenue, Trading Estate, Slough, Bucks —**Stand 103.**—Sand and gravity die castings in all aluminium alloys and yellow metals and pressure die castings in zinc-based alloys are shown.

Small Electric Motors, Ltd., Eagle Works, Churchfields Road, Beckenham, Kent.—**Stand 219.**—An interesting welding exhibit is a medium frequency s.p. alternator set which is claimed to have particular advantages in respect of shielded atmospheric welding using argon, etc., and the welding of aluminium and stainless steel. It has been developed in association with the Arc Manufacturing Co., Ltd.

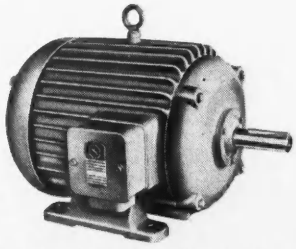
Smiths English Clocks, Ltd., Sectric House, Waterloo Road, London, N.W.2.—**Stand 189.**—The exhibits include electric clocks with pictorial dials, of which the "Dickens" and the "Widgeon" are outstanding examples.

South Wales Switchgear, Ltd., Blackwood, Mon.—**Stand 152A.**—The company's display includes a 33 kV, 1,000 MVA outdoor oil circuit breaker with a motor wound spring operated mechanism; a fault making isolator type I.F.4 with a standard air insulated metalclad oil circuit breaker unit having a spring operated mechanism and being suitable for 11 kV, 250 MVA service; a two panel control board section; and "T" type switch-fuse gear with flush fronted cubicles and removable operating handles, thus maintaining the unobstructed frontal appearance. The type "T.300" equipment is suitable for operation with fuses from 2 to 300 A and the type "T.800" equipment with fuses from 300 to 800 A. Clearances and insulation are suitable for 660 V systems.

Standard Telephones & Cables, Ltd., Connaught House, Aldwych, London, W.C.2.—**Stand 40.**—An oil-filled cable installation portrays in diagrammatic and model form the simplicity of operation of a typical 132 kV oil-filled cable set-up and the ease with which it can be accommodated to bulk power transfer requirements. There is also a representative selection of "Standard" l.v. capacitors (up to 550 V) for the correction of consumer loads; a transportable 50 kV "SenTerCet" cable test equipment which is one of a large range of equipments, including trailer-mounted units, which are available for applying d.c. tests to power cables; a miniature local control system for an electric substation.

J. G. Statter & Co., Ltd., 82, Victoria Street, London, S.W.1.—**Stand 161.**—A wide range of exhibits includes circuit breakers and switchgear suitable for use on system voltages up to 15 kV and of up to 250 MVA rupturing capacities. For use on l.v. systems is the new range of air circuit breakers having an A.S.T.A. tested and proved rupturing capacity rating of 26/31 MVA, 415 V which are available in both fixed and horizontal drawout types. There is also the "VL" h.v. metalclad automatic oil fuse-switch unit of the "trips-all-phases" type, a non-automatic oil switch of the fault making load breaking type to form extensible switchboards. A non-extensible type "VL/2-OD" metalclad ring main tee-off switchboard incorporating units of this type, an 11 kV metalclad air insulated drop-down drawout automatic oil circuit breaker unit fitted with a spring closing mechanism arranged for motor recharging for use in unattended substations and a non-automatic oil switch unit suitable for coupling to this type of gear are shown.

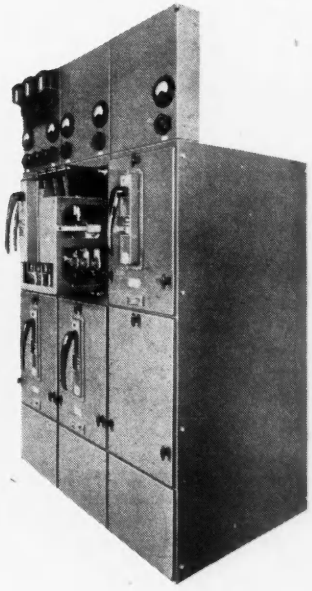
Strand Electric & Engineering Co., Ltd., 29, King Street, London, W.C.2. —**Stand 181.**—Stage lighting equipment ranges from a 250 W spot, using the new class "T" projector lamp and giving twice the usual light output, to an arc lamp rated at 13 A a.c. while

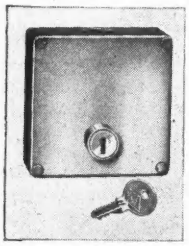


Small Electric Motors surface-cooled motor

Smiths "Gilroy" electric clock

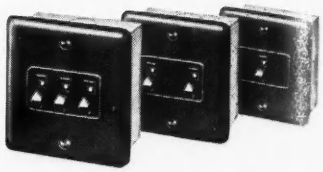
Statter switchboard equipped with h.r.c. air-break circuit breakers





Wandsworth "Wemlock" key switch

Tufnol fish-plate insulators, bushes and spacers



Kersons "Uniquail" 5 A switches

giving a light output equivalent to 90 A d.c. There is also a range of lighting control boards from the simplest form suitable for schools to the most elaborate with pre-setting, pre-selection, etc.; pre-focus and other lampholders suitable for indoor and outdoor use; a new 15 A 3-pin connector socket outlet; and a range of floodlights.

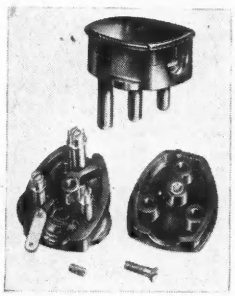
Sun Electrical Co., Ltd., 118-124, Charing Cross Road, London, W.C.2. —**Stand 185.**—Apparatus on view includes a hospital luminous call system; a visual staff locator system with a capacity of 100 signals; time and delay switches of various types; motors, normal and geared reduction types, up to 5 h.p. including totally enclosed machines to B.S. 2083: 1954; pumps of various types including submersible patterns; ventilating fans; measuring instruments; and electric power tools, with demonstrations of a recent design of hole cutter.

Sunvic Controls, Ltd., 10, Essex Street, London, W.C.2.—**Stand 28.**— Domestic products being exhibited include a new water heater thermostat designed to meet the modern demand for simpler immersion-type thermostats which are set to a predetermined temperature and can be withdrawn without draining the hot water system, costing only half as much as conventional stem types. The "Simmerstat," radiant boiling plates and oven thermostats are displayed, together with a range of typical industrial controls such as hot-wire vacuum switches, energy regulators and thermostats.

H. D. Symons & Co., Ltd., Park Works, Kingston Hill, Surrey.—**Stand 34.**—Prominent are varnished fabrics and slot insulations used in the manufacture of electric motors. The fabrics include varnished cambric, silk, glass, nylon and terylene and the slot insulations "Symax," "Duply" and "Emlin."

Synchronome Co., Ltd., Abbey Electric Clock Works, Woodside Place, Alperton, Middx.—**Stand 78.**—Electrical impulse clocks, tower clocks, time recorders, electronic chiming apparatus, timing devices, discrepancy timing indicators, watchman's "Tell Tale" clocks and burglar alarms are among the exhibits on this stand.

Synthetic Carbon & Engineering Co., Ltd., Cumberland Road, Stanmore, Middlesex.—**Stand 15.**—The display includes carbon brushes of all shapes and grades, conventional carbon contacts and newly developed metallized carbon contacts having the advantage of higher conductivity than ordinary carbon, but retaining such features as good impact strength, low friction and freedom from welding. There are also brush holders in all forms, copper gauze and laminated brushes, contact parts, controller fingers and contact tips in silver and copper, etc.



"Temco" a.c. plug top showing construction

T.M.C. Harwell (Sales), Ltd., 37, Upper Berkeley Street, London, W.1. —**Stand 182.**—On this stand is a full range of "Temco" electrical wiring accessories, and a particular feature is an enlarged working model of the q.m. & b. switch action used in the series of "Temco" a.c. switch sockets. There is also a selection of "Temco" synchronous electric clocks.

George E. Taylor & Co. (London), Ltd., 34, Southwark Bridge Road, London, S.E.1.—**Stand 202.**—Depicting the company's comprehensive consulting service to clients there are photographs of typical installations together with examples of workmanship. There is also on show the Taylor earth.

Telegraph Condenser Co., Ltd., Acton, London, W.3.—**Stand 148.**— The use of static condensers for power factor correction is demonstrated. In addition to examples of tank types fitted with oil circuit breakers, pole mounting steel boxes and standardized units for mounting in banks, one model has a lightly loaded motor with appropriate meters showing volts, amps and power factor and a push-button switch brings into circuit for 30 sec a condenser correcting the p.f. to 0·95 and indicating a reduction in current and kVA. Motor starting condensers and suppressor condensers are on view together with a selection of printed circuits.

The Telegraph Construction & Maintenance Co., Ltd., Telcon Works, Greenwich, London, S.E.10.—**Stand 191.**—This exhibit includes p.i. power cables of all types for voltages up to 22 kV with copper or aluminium conductors and lead or aluminium sheaths, polythene insulated power cables for voltages up to 11 kV for underground or submarine use, and polythene insulated 11 kV three-core aerial cable with catenary suspension strands attached, together with appropriate fittings.

Tetra Engineering Co., Ltd., 1-3, Redhill Street, London, N.W.1.—**Stand 207.**—On show here are tubular sheathed, mineral embedded heating elements, kettle elements and washboiler and washing machine elements. Bimetals smelted in vacua, solid type boiling plates ("Ego"), resistance thermometer units ("Heraeus") and "Manganin" and "Centanin" resistance wire are also exhibited.

Thermodare (Great Britain), 79/80, Petty France, London, S.W.1.—**Stand 64.**—A Thermodare storage space heater may be seen here, while some specially designed guards for factory use and a metal top for fitting over the heaters to provide shelving in offices are also displayed.

Thorn Electrical Industries, Ltd., 233, Shaftesbury Avenue, London, W.C.2.—**Stand 210.**—A sphere demonstrating various unusual lighting effects, and a 14ft fluorescent wall of continuously changing colour controlled by electronic light-mixing equipment are among the main features of this stand. "Atlas" fluorescent equipment is represented by a number of fittings, among which are trunking and the "Troffer HT0080," a new display lighting system providing triple-tube colour changing, and a portable fluorescent lighting unit. There is also a representative display of "Atlas" tungsten lamps, and a new range of school lighting fittings. Tricity Cookers, Ltd., present their new "Coronet," model 550, auto-time-switch controlled cooker.

F. W. Thorpe, Ltd., Thorlux Works, Welby Road, Hall Green, Birmingham, 28.—**Stand 81.**—A complete range of fluorescent, tungsten and mercury industrial lighting fittings, finished in vitreous enamel, is displayed as well as fluorescent continuous trunking with detachable vitreous reflectors, including the "Slydalong" system whereby reflectors can be moved to any desired position on the mains trunking.

Troughton & Young, Ltd., Knightsbridge, S.W.3.—**Stand 162.**—This

stand is designed to display a new range of fluorescent lighting fittings for industrial and commercial purposes, these fittings being additions to the "Tubalux" range with many new designs. There is also a new conception of an industrial trough reflector giving upward as well as downward projection. The commercial type fittings incorporate "Perspex" diffusers.

J. H. Tucker & Co., Ltd., King's Road, Tyseley, Birmingham, 11.—**Stand 99.**—The complete range of the company's accessories is represented. It includes switches, lampholders, switched sockets, sockets and plugs, industrial ironclad switch and switched socket assemblies, indicating control units for wall and ceiling mounting and l.v. terminal units. The 1955 products include 5 and 15 A resilient moulded plugs, 15 A ironclad protected surface switch assemblies and adjustable c.i. grid boxes with up to 24 sections.

Kersons electrical accessories suitable for domestic and industrial installations are also displayed, including tumbler switches for wall and ceiling mounting, appliance switches, bell pushes, switched socket outlets, industrial ironclad assemblies.

Tudor Accumulator Co., Ltd., 137, Victoria Street, London, S.W.1.—**Stand 42.**—Here there are typical cells from the various ranges of batteries available for many applications and also displayed is a complete self-contained 30 V switch-tripping equipment. The "Safetylyte" emergency lighting equipment is also on view.

Tufnol, Ltd., Perry Barr, Birmingham, 22B.—**Stand 144.**—Specimens of "Tufnol" sheets, tubes and rods and an interesting display of components moulded to specification or machined from these basic forms with the usual engineering tools are featured. An electrical insulator for supporting live rails on electric railways is virtually unbreakable and has an exceedingly long life in extremes of climatic conditions. Bushes, fish-plate insulators and spacers for insulating rail track circuit signalling systems are shown.

Uni-Tubes, Ltd., 9, South Molton Street, London, W.1.—**Stand 174.**—The "Kopex" electrical conduit, which comprises layers of continuous metal and paper strip or metal strip spirally wound, can be set easily by hand to negotiate corners and curves, eliminating the need for bends and elbows.

V.G. Porcelain Co., Ltd., Gorst Road, Park Royal, N.W.10.—**Stand 142.**—The exhibits include silver, platinum or nickel metallized ceramics for seals, etc., interlocking and cylindrical beads, formers for instrument makers, fuse barrels, and "Scruit" connectors in four sizes.

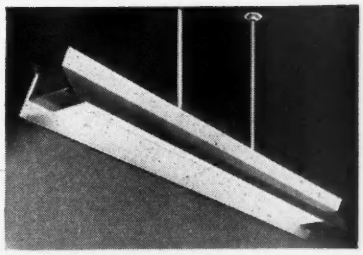
Vanguard Engineering Co., 197-199, Lee High Road, London, S.E.13.—**Stand 221.**—Fluorescent lighting control equipment shows low power factor and high power factor chokes and units including choke p.f. condenser and starter switch holders. Fluorescent fittings with combined starter holder and lampholder are on show together with transformers for the neon and radio trades.

Varilectric, Ltd., 10, Melon Road, Peckham, London, S.E.15.—**Stand 188.**—Both large and small switchboards, incorporating special features for easy installation, connection and maintenance, include one with oil circuit breaker panels added. A.S.T.A. tested fused-switches form part of each switchboard.

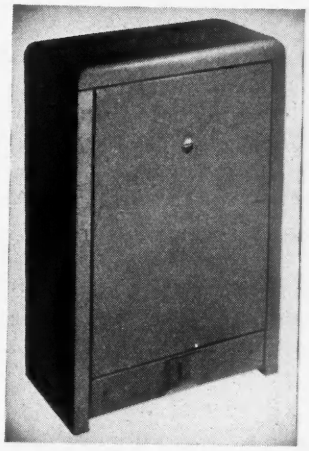
Volex Electrical Products, Ltd., Salford, 6.—**Stand 82.**—The use of plastic materials in manufacture is the keynote of this display. Among the examples shown are plastic shades; accessories, including lampholders and plug sockets; and small cables.

W. G. Walker & Co. (Engineers), Ltd., Emery Hill Street, London, S.W.1.—**Stand 135.**—The display comprises an overhead busbar system, incorporating take-off boxes, examples of cast fittings additional to and interchangeable with sheet steel trunking and accessories and tap-off boxes.

Walsall Conduits, Ltd., Excelsior Works, West Bromwich.—**Stand 24.**—Electrical equipment from the smallest conduit accessories to heavy duty flameproof panels, covering domestic, commercial and industrial installations is on view. New products include underfloor duct boxes for shallow floors; B.S. earth clips; cable glands for flexible and metal sheathed, unarmoured and armoured cables; 30 A "sparkless" mercury tube switched socket outlet and plug; triple pole "sparkless" mercury tube switches; 30 A weatherproof switched socket outlet and plug; flameproof contactor starters; 5 A "Pygmy" flameproof switch; weatherproof flameproof well glass fitting; and 60 A flameproof fused distribution unit.



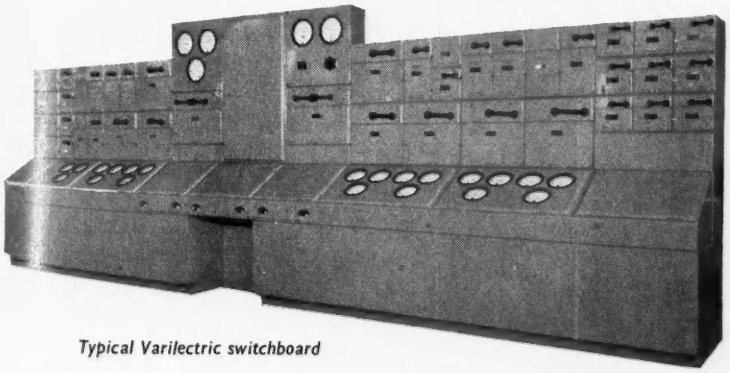
Troughton & Young industrial fluorescent fitting



Thermodare storage space heater

Wandsworth Electrical Manufacturing Co., Ltd., Albert Drive, Sheerwater, Woking.—**Stand 54.**—A comprehensive range of mercury switchgear for hospital operating theatre installations includes a new switchplug with 30 A capacity switch for mobile X-ray apparatus. The company is also showing latest designs in flush and surface type plate assemblies, switchplugs, including a new 13 A compact pattern, pilot light units, "Wemlock" cylinder lock range of switches and switchplugs that can only be operated by a special key, multiple phase lighting switch assemblies, nurses' home units, and "Bunnie" electric incinerators.

Watford Electric & Manufacturing Co., Ltd., Whippendell Road, Watford, Herts.—**Stand 218.**—A range of automatic airbreak control gear is exhibited, with examples of high performance contactors, individual motor starters, multi-motor control panels and auxiliary equipment. A 3.3 kV direct switching starter suitable for motors up to 1,000 h.p. and the O.G.R.



Typical Varilectric switchboard

overload relay, fitted with a glass dashpot and employing silicone fluid, together with temperature control equipment including a centralized control panel, associated motorized valves, detectors, etc., are also on view.

Watliff Co., Ltd., Lombard Road, Morden Road, South Wimbledon, S.W.19.—**Stand 115.**—Moulded and built-up commutators and slip-rings.

Weir Electrical Instrument Co., Ltd., Bradford-on-Avon, Wilts.—**Stand 129.**—On the company's stand there are a variety of ammeters, voltmeters, frequency meters in moving coil, moving iron and rectifier types; a transductor for the measurement of direct current up to 12·5 kA; shunts up to 5,000 A for use with switchboard or portable instruments; also gas and oil operated relays for the protection of oil-filled transformers in single and double float patterns for 1in, 2in and 3in diameter pipe sizes. Of particular interest are new moving coil type instruments employing centre core magnets in sintered magnetic material.

Westinghouse Brake & Signal Co., Ltd., 82, York Way, King's Cross, London, N.1.—**Stand 158.**—A feature is a display of high performance metal rectifier equipments manufactured for particular applications, including a d.c. power unit for feeding a "Sparcatron" spark cutting machine, an equipment designed for use with the "Dalic" plating process, a power unit supplying cinema projector arcs, and a special constant potential battery charger fully tropicalized and shock tested for use in the services. A constant potential transbooster equipment, providing a 28 V supply for aircraft component testing, is on view, and for the automatic control of the Bengough Stuart anodizing process there is a specially developed controller used by aircraft constructors.

Westool, Ltd., St. Helen's Auckland, Bishop Auckland, Co. Durham.—**Stand 204.**—A range of electromagnetic clutches and brakes is being manufactured under licence from the Warner Electric Brake & Clutch Co. of America. Specimens of transformers and coils are also displayed, including some for operation at ambient temperatures of 400 deg C. Examples of hermetically sealed transformers and chokes are shown and on the "Motor Way" stand are an interesting miniature motor model and a windscreen wiper motor, specially designed for aircraft work.

Westwood Switchgear, Ltd., 22, Gorst Road, London, N.W.10.—**Stand 183.**—This company's unit assembly switchboards comprise a symmetrical assembly of standard size precision built units mounted on wall fixing framework or floor pedestals. Other products are dead front, flat back, cubicle and battery charging switchboards, feeder kiosks, heavy current plugs and sockets, knife switches, instrument switches and l.v. fuse units.

Whipp & Bourne, Ltd., Switchgear Works, Castleton, Rochdale.—**Stand 61.**—The company's a.c. marine type switchboard is suitable for working on a 440 V, 3-phase, 60 c/s system and is fitted with withdrawable pattern a.c. air-break circuit breakers of up to 900 A capacity. A d.c. industrial type switchboard is of the dead-front type and is for use on 110 V, 2-wire, d.c. systems. The d.c. circuit breakers are of the withdrawable air-break pattern and are of up to 1,500 A capacity. A motor-operated main exciter field rheostat is arranged for working with a.v.r. equipment for turbo-alternators.

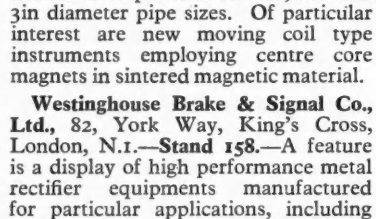
William White (Switchgear), Ltd., Carlton Works, Coldharbour Lane, London, S.W.9.—**Stand 149.**—This display includes switchgear, ring main equipment, junction boxes, dynamo control panels and distribution boards for service in H.M. ships; laboratory control and supply panels for use in an Admiralty research and testing establishment; cubicle switchboards, contactor panels, distribution boards and rising main distribution panels; electrical components and replacement parts for British Railways; changeover switches and isolators for h.f. furnaces; and load regulators for electrode furnaces.

Henry Wiggin & Co., Ltd., Wiggin Street, Birmingham, 16.—**Stand 169.**—High purity nickel, nickel-iron alloys of controlled expansion and magnetic nickel-iron alloys which have been developed by using a powder metallurgical technique, are shown in the form of strip, rod and wire. Other products include nickel for cathodes and other electrodes of electronic valves; nickel-manganese alloys for electrode supports; nickel-iron alloys for glass/metal seals and electrical resistance alloys and bimetals.

Woden Transformer Co., Ltd., Moxley Road, Bilston, Staffs.—**Stand 120.**—An exhibit here is a specially compact 5 kVA rural low-loss distribution transformer using a "C" type core. The actual voltage ratio is 11 kV/250 V with ± 5 per cent tappings on the l.v. windings. A 1,000 kVA distribution transformer, a range of pole mounting rural distribution transformers and a special "C" core spot welding transformer for use in press welding are also displayed.

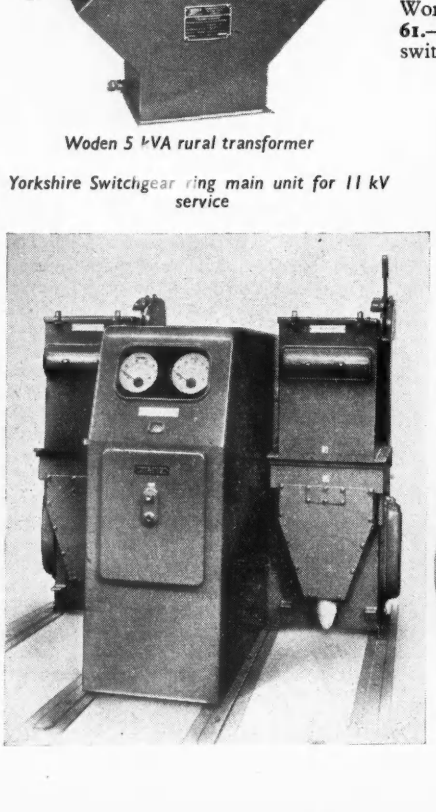
Woods of Colchester, Ltd., Colchester, Essex.—**Stand 195.**—Fans and ancillary equipment are shown and one of the new products is a silencer for "Aerofoil" fans. A simple cylinder, without splitters or baffles, this standardized unit substantially reduces the sound emission from a fan without affecting air flow. Two other new products are a radial vane damper for volume regulation or performance boost and a roof extract unit.

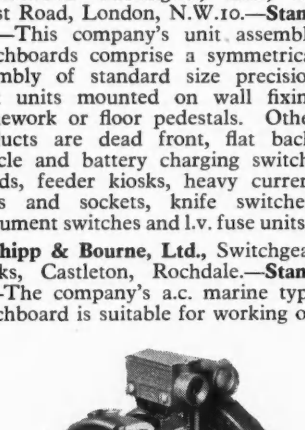
Yorkshire Switchgear & Engineering Co., Ltd., Meanwood, Leeds, 6.—**Stand 75.**—Here is shown a ring main unit for 11 kV service and of 400 A capacity with oil switches on either side of an automatic oil circuit breaker. The former control the ring cable and the automatic oil circuit breaker the local transformer.



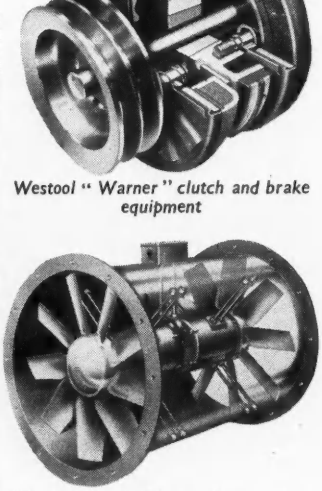
Woden 5 kVA rural transformer

Yorkshire Switchgear ring main unit for 11 kV service





Westool "Warner" clutch and brake equipment



Woods "Aerofoil" two-stage contra-rotating fan

INDUSTRIAL NEWS

Scholarships and Awards

One difficulty encountered by young men and women wishing to take up a career in the electrical industry is knowing where to go for information of the kind they require. Most aspirants nowadays need financial help in the form of grants or scholarships but they may find it hard to obtain details of what assistance is available. Such people (and their parents) will welcome a booklet just produced by the Education Committee of the British Electrical and Allied Manufacturers' Association (36, Kingsway, London, W.C.2) containing brief particulars of "Scholarships and Awards for Training in Electrical and Allied Engineering" and advice to young people seeking entry to the industry.

Included in the list (which is admittedly not a complete one) are awards made by professional institutions and associations, external donors, schools and colleges, and universities. The list covers not only entrance scholarships but also post-graduate and research awards for study both at home and abroad. Copies of the booklet have been sent to over 2,500 schools and technical colleges throughout the country. Mr. D. D. Walker, chairman of the B.E.A.M.A. Council, stresses in a foreword the need for a regular intake of well-trained and able recruits to fill the many responsible positions in the industry if expansion is to be maintained.

Electricians' Wages

Reporting the negotiations which led to an increase of 3d an hour in the wages of journeymen electricians in the electrical contracting industry as from 14th March, *Electron* (the journal of the Electrical Trades Union) says that the Union's executive council regards the settlement as an "interim" one. It must be related to the immediate negotiations that were to take place through the National Joint Industrial Council in connection with the improvement in conditions of employment affecting such matters as abnormal conditions payments, country allowances, holiday credits, exhibition allowances, payment during sickness "and a further increase in wages in the near future in addition to the present wages settlement of 3d per hour"

Electricity in L.C.C. Schools

To-day (Friday) Mr. I. J. Hayward, Leader of the London County Council, will throw a switch bringing electricity to Peckham Park School, the last county school in London to remain gas-lit, and a post-war programme of electrifying more than three hundred schools will then have been completed.

Conversion to electricity in the schools had been started before the last war, but hostilities brought this work to a standstill. Since the war the electrification scheme has had to take its place with many other improvement schemes. In 1946, however, the Council decided that electricity should be installed in the remaining 300 schools. This work has included not only the provision of electric lighting but also of power points for housecraft and handicrafts and, where required, l.v. apparatus for science work. This programme, now about to be completed after eight years' work, has cost the L.C.C. some £800,000. About a hundred electrical contracting firms have been employed. In the course of the post-war work 123,000 lighting points and about 13,500 outlet sockets have been installed. The length of twin cable used has been about 450 miles and the installed load is equal to 15,000 kW. Following the ceremony at Peckham Park School, there will be demonstrations and displays of equipment showing the use of electricity in schools.

"Planned for the Purpose"

This is the title of a new film produced for the British Electrical Development Association by Greenpark Productions, Ltd., in association with the Film Producers' Guild. It is longer than the usual E.D.A. film (it runs for 43 minutes) but it will hold the interest of those for whom it is designed—works managements and industrial engineers.

Primarily the film shows how production is facilitated and raised by the proper planning of a factory, but it is made obvious that proper planning means a full use of electrical methods.

After an explanation of the general principles governing factory design and arrangement for mass, batch or unit production, the application of these principles is shown in cooker production, a portable electric tool factory, a printing works and a laundry. Various electrical processes such as infra-red drying and high frequency induction heating are introduced and special attention is given to lighting.

Copies of the film (16 mm or 35 mm) are available on free loan from the Association at 2, Savoy Hill, London, W.C.2.

Portable Tools in the Building Industry

A film dealing with the uses of portable power tools in the building industry was recently shown to representatives of building and allied interests by Wolf Electric Tools, Ltd. The film was made in co-operation with the Bunting Construction Co., Ltd., and the L.C.C. Brixton School of Building, where a course of instruction is given in the use of portable hand tools in carpentry and joinery. Further instruction on suitable techniques is contemplated in all the standard courses at this school.

Uses illustrated were the sanding of floors; drilling, plugging and chasing of walls; drilling and mortising of wood; and the sawing of wood, asbestos, metal, etc., by the use of saws or abrasive discs.

A visit was subsequently paid to the Wolf works at Hanger Lane, one of the company's five factories which between them produce about 600 tools a day. The company has its own light alloy foundry, does a great deal of die-casting of body parts, and carries out all machining, winding and assembly operations. A workroom equipped with all types of portable tools and accessories is used for

One of two English Electric 220 kV transformers which are being supplied to the City of Seattle, Washington, U.S.A. The transformer was loaded in the "Portland Star" in the Gladstone Dock, Liverpool, during the recent blizzard

A Wolf disc grinder in use

demonstrations and also as a schoolroom where agents and dealers throughout the country attend courses of instruction in the use and maintenance of the tools. Since its inception 1,300 persons have attended 3-day courses taking a maximum of twelve.

The use of a low voltage tool in conjunction with a suitable centre-earthed transformer can play a significant part in reducing electrical accidents, especially on outdoor sites, and it was pointed out that any of the company's range of tools could be supplied wound for 110 V or 50 V.

Commercial Staff Training

A further training course for service centre assistants and demonstrators has just been concluded by the South East Scotland Electricity Board. The staff attending the course were all recent entrants into the industry. The course lasted five days and covered a wide range of subjects including electrical installations and wiring accessories, tariffs, cookers, accountancy records and methods, refrigerators, water heating, lighting, salesmanship, and service centre and window displays. As in previous years the talks, which were illustrated by demonstrations, films and lantern slides, were given by representatives of manufacturers, the Electrical Development Association and the Board's headquarters staff.

Book on Ironing

In the "Bride's Book on Ironing" (price 1s) the General Electric Co., Ltd., has for the first time presented all the information a woman needs to have on ironing in a concise and fully illustrated form. The text is by Margaret Leader, the company's senior housecraft adviser. After several pages of useful general hints, the ironing of different materials and articles is described in detail, every important step being clearly illustrated. The instructions are based on the use of the G.E.C. "Bride's" iron, and it is emphasized that thermostatic control makes a heavy sole plate unnecessary—a light iron makes light work. An index facilitates reference to the 79 subjects discussed.

Overseas Fairs

The Board of Trade is installing trade inquiry stands at the forthcoming international fairs at Utrecht (22nd-31st March), Milan (12th-27th April), Brussels (23rd April-8th May), Gothenburg (14th-22nd May), and Toronto (30th May-10th June). United Kingdom exhibitors at these events are invited to call at the stands to discuss any problems which may arise as a result of their participation in the fairs, or to seek advice on trade with the countries concerned. As well as providing focal points for commercial inquiries, the official stands at Utrecht and Brussels will display details of United Kingdom representation in the trade sections of the Fair. The United Kingdom Trade Commissioner in Toronto will be in charge of the official stand at the Canadian International Trade Fair.

Gauge & Tool Makers' Handbook

The sixth edition of the Gauge and Tool Makers' Association Handbook summarizes the aims, objects and activities of the Association. It includes a complete list of the 308 member firms and a buyers' guide index to their manufactures. Copies are available free of charge from the Association, Standbrook House, 2-5, Old Bond Street, London, W.1, to all actual and potential buyers of British tools and gauges both at home and overseas.

Mr. N. F. Phillips (E.D.A.) giving a talk on window and service centre displays at the S.E. Scotland Electricity Board's course for commercial staff training

Commercial Television Order

Associated-Rediffusion, Ltd., through its technical advisers, Central Rediffusion Services, Ltd., has placed with Marconi's Wireless Telegraph Co., Ltd., a contract for the provision and planning of most of its studio and outside broadcast equipment. The initial order includes the complete installations for three 3-camera studios, one 2-camera studio and two complete 3-camera television outside broadcast vehicles. In addition, Marconi's are also to supply one set of master control switching and central apparatus equipment, and the equipment for a further television outside broadcast unit, less vehicle. This large order is being completed so that Associated-Rediffusion can be on the air by 1st September. Associated-Rediffusion, Ltd., has recently acquired Adastral House (to be renamed Television House) in addition to former film studios at Wembley and a theatre at Walham Green. Marconi engineers, as part of the company's comprehensive planning service, are assisting Central Rediffusion engineers with the technical details of the conversion to television studios. In addition, the facilities of Marconi College are being made available for the training of engineering staff.

I.T.A. Television Station

Work on the temporary transmitter building at Croydon for the Independent Television Authority has commenced. The contract for this temporary station, complete with 200ft tower and a special high gain aerial, has been awarded to Marconi's Wireless Telegraph Co., Ltd., which is also supplying the vision and sound transmitters. The architects are Taylor & Collister of Chelmsford, and the building work is being carried out by John Laing & Son, Ltd.

Exports to North Viet Nam

The Board of Trade announces that all exports to North Viet Nam are subject to licensing control as from 9th March. In consultation with other countries it has been agreed that licences will not normally be issued for exports to North Viet Nam of goods which are subject to embargo when destined for China.

Danfoss Film Show

We are informed by the Danfoss Manufacturing Co. that no further accommodation is available at its film show on 14th March of automatic electrically-operated controls for oil

burner plants. It has therefore decided to hold an additional show on 24th March at Film House, 142, Wardour Street, London, W.1. Applications for tickets should be made to the company's London office, 69, Victoria Street, S.W.1.

E.T.U. Expulsions

As we have already reported, a fine of £20 was imposed by the Electrical Trades Union on Mr. M. Benson, one of the members of the Union who returned to work without Union permission and thus ended a dispute between E.T.U. members and J. Lyons & Co., Ltd. Mr. Benson refused to pay the fine and it was announced that he was to be expelled from the Union. At a meeting of the Stoke Newington (N.) branch on 4th March Mr. Benson was told that he could no longer attend branch meetings; his membership will lapse at the end of the current quarter.

Mr. L. Wells, another of the men concerned, was told by Hammersmith branch on 4th March that his appeal against expulsion could not be heard as the branch had endorsed the Executive Committee's decision to expel him. A member of the branch is reported to have said after the meeting that unless the three expelled men were "reprieved" the Union would break its own closed-shop policy because the company would refuse to dismiss them and their fellow members would continue to work with them.

Jersey Electricity Co.'s Activities

The Jersey Electricity Co.'s new travelling showroom was officially opened by Lady Coutanche, wife of the Bailiff of Jersey, on 5th February. It is primarily intended as a mobile service centre for the greater convenience of people living in the country districts, particularly as accounts can also be paid there. The van carries a selection of large and small appliances. The vehicle itself is painted green and was adapted from an old mobile greengrocery shop. It has its own built-in hot and cold water supplies, fluorescent cornice lighting, short-wave radio, etc., and has facilities for quick connection to the mains.

On 16th February Miss Marguerite Patten, T.V. cookery expert, was "at home" to the people of Jersey. Invited to the Island by the Jersey Electricity Co., Ltd., she gave two cookery demonstrations in the West Park Pavilion. Nearly 1,000 attended the demonstrations. Two cookers—a G.E.C. DC.114 and an English Electric—were given away by the companies concerned to persons holding souvenir leaflets bearing certain numbers.

E.I.B.A. Golden Jubilee

Readers are reminded that a luncheon to celebrate the golden jubilee of the Electrical Industries Benevolent Association is to be held at the Connaught Rooms on Tuesday, 19th April. The guest of the day will be Sir John Maud, K.C.B., C.B.E., Permanent Secretary to the Ministry of Fuel and Power.

It is hoped that there will be a representative assembly from all of the many branches of the electrical industry, including ladies. Applications for tickets (one guinea each) should be sent, accompanied by an appropriate cheque, to the E.I.B.A., 32, Old Burlington Street, London, W.1.

British Electronic Camera for U.S. Government

Claimed to be the highest-speed camera in the world, a new equipment built by Winston Electronics, Ltd., Hampton Hill, Middlesex, was dispatched by air to the United States on 1st March. It will be used at the Aberdeen proving grounds, one of America's major weapon-testing centres, and was specially designed and made for the United States Government.

The apparatus, which is described as a "sequential image convertor," consists of two large cabinets: the power unit and optical unit. These control electronically a Mullard image convertor tube on the face of which six sequential pictures of extremely fast-moving phenomena are obtained. It has been devised and developed to enable photographs of one ten-millionth of a second exposure and at one half-millionth of a second intervals to be taken, six at a time. This is a frame-rate of two million per second.

Boiler Plant for B.E.A.

In our last issue we referred to orders placed by the British Electricity Authority for a 200 MW turbo-generator (English Electric Co., Ltd.), and associated pulverized fuel-fired boiler plant (International Combustion, Ltd.). We are now informed by International Combustion, Ltd., that its order from the B.E.A. is for three of the largest water-tube boilers in Europe, operating under the most advanced conditions of steam pressure and temperature in this country. So far as is known this contract, the value of which approaches £10 million, is the largest single contract for boiler plant ever placed in this country and will provide work for some five to six years ahead.

Productivity Conference

Mr. C. T. Melling, chairman, Eastern Electricity Board, in addressing a meeting of East Anglian industrialists in Cambridge on 2nd March, said that in his opinion the use of electricity was vital to productivity—it was, in fact, the key to productivity. At this meeting, which was arranged by the Eastern Electricity Board, the importance of electricity in the industrial drive for increased production was stressed. It was pointed out that increasing production by greater use of electrical methods does not necessarily involve a large increase in the amount of electricity used. Mr. E. A. Fowler, the Board's chief commercial officer, referred to the advisory service available. The Board's experts were able to offer

The Jersey Electricity Co.'s new travelling showroom and service centre

Mr. C. T. Melling speaking at the productivity conference. With him are (left) Mr. E. A. Fowler and (right) Mr. W. W. S. Robertson

advice on problems concerning the industrial use of electricity. Mr. W. W. S. Robertson, chairman of the Eastern Regional Board for Industry, congratulated Mr. Melling on initiating the meeting.

Building Centre Lighting Display

A selection of new "Mazda" commercial and industrial lighting fittings has been installed as a display in the Building Centre at 26, Store Street, London, W.C.1. All the fittings on show are mounted on the recently introduced "Invertrunking" or as components of "Mazda" universal industrial trunking. They include the F1234, a 5ft fluorescent fitting with an all-"Perspex" diffuser cover; 5ft fluorescent reflector fittings with open and closed ends; and "Cupola" swivel fittings housing 75 W reflector floodlights.

Lighting Equipment for Kuwait

Street lighting lanterns and equipment (valued at over £100,000) were recently dispatched from the Halifax works of Alfred Graham & Co., Ltd., to the Salford docks. Destined for Kuwait, the consignment was part of the complete order received by Siemens Electric Lamps & Supplies, Ltd., for lighting the replanned city. Special lanterns developed by Siemens were manufactured by their subsidiary company, Alfred Graham, Ltd.

Improved Fluorescent Efficiencies

As a result of improving performance during the last twelve months revised efficiencies for all sizes of "white" 3,500°K and "daylight" fluorescent tubes are announced by the Atlas lighting division of Thorn Electrical Industries, Ltd., and Ekco-Ensign Electric, Ltd. The increases vary between 5 per cent and 12½ per cent. The 80 W "white" tube now has an average light output through 5,000 hours' life of 4,160 lumens and the "daylight" tube 3,920 lumens.

New House Journal

The Pioneer Oilsealing & Moulding Co., Ltd. (a division of J. H. Fenner & Co., Ltd.), has published the first edition of a new house magazine, "The Oilseal Journal." Introductory notes are contributed by Mr. E. Hepworth, director and general manager, and information is given on up-to-date oilsealing technique.

Annealing and Galvanizing Furnace

Birlec, Ltd., of Erdington, Birmingham, tell us that they have recently been commissioned by the Head Wrightson Machine Company, Ltd., Middlesbrough, to build a continuous driven roller hearth annealing and galvanizing furnace for installation at a South Wales steelworks.

The equipment will be the largest heat treatment plant of its type yet undertaken by this company and it will handle steel strip of up to 48in width at an output of 10 tons per hour. The installation will be over 300ft in length and the heating furnaces will be accommodated on a staging over 20ft high. The combined electrical rating of furnace elements, drive gear, etc., will be approximately 1,000 kW and the gas consumption (using coke oven gas, which is available on site) about 30,000 cu ft/hr.

Three methods of furnace heating will be employed; open gas burners for preheating, gas-fired radiant tubes, and electrical resistance elements, where extremely close temperature control is required and to heat the galvanizing bath.

Contract for Opencast Working

The largest single contract for working opencast coal ever to be placed in Great Britain has been awarded by the Opencast Executive of the National Coal Board to Richard Costain, Ltd. It is for working 5,000,000 tons of coal on the Acorn Bank Farm site in Northumberland. The site lies on the banks of the River Blyth and coal will be produced at the rate of about 750,000 tons a year for six or seven years. The overburden, boulder clay, sandstone and shale, will be handled by two electric 1150-B "Bucyrus" walking dragline excavators, capable of moving 1,125 tons weight in 8ft "strides." In addition, three electrically-operated rock shovels will be used.

Reading Installation Tender

Acceptance by Reading Corporation Housing Committee of the tender of the Southern Electricity Board—which was not the lowest—for electrical installations in 103 Council houses was recently questioned by the Ministry of Housing and Local Government. The Ministry indicated that it would not feel justified in granting loan sanction "in respect of a tender higher than that of the lowest submitted and regarded by the Council as satisfactory." After discussions with Ministry representatives the Corporation has reaffirmed its decision to accept the Board's tender and to meet the necessary expenditure out of revenue.

Bristol Exhibition

The Sloan Electrical Co., Ltd., is holding an exhibition in the Windsor Room, Grand Hotel, Broad Street, Bristol, on 21st and 22nd March, at which it is displaying "Tuvec" convector/tubular heaters, "Heatovent" console convectors, reflector heaters and unit heaters; Reyrolle metalclad switchplugs and plugs and sockets; and "Summit" vacuum cleaners.

E.A.W. Bradford Branch

The Bradford and District Branch of the E.A.W. celebrated its silver jubilee at a dinner on 8th February when the chair was taken by Mrs. Lambert, branch president. The toast of the Association was proposed by Mr. A. Bond, deputy chairman, Yorkshire Electricity Board, and responded to by Miss Norah Balls, J.P., chairman of the Association. The civic toast was proposed by Councillor A. S. Dowsey, member of the Yorkshire Electricity Consultative Council, and the response given by the Lord Mayor, Ald. F. J. White, J.P. The toast of the guests was proposed by Mrs. Cowling, past chairman, Bradford Branch, and Mr. A. Haselhurst, Yorkshire Electricity Board, responded.

A.E.I. Acquisition

Associated Electrical Industries, Ltd., has now acquired the whole of the undertaking of the Australian General Electric Pty., Ltd., one of the largest electrical manufacturing and trading companies in Australasia. With head offices in Sydney, A.G.E. has five factories and employs in these and in the sales organization some 2,500 staff and workers. The largest works are at Auburn, N.S.W., and Richmond, Victoria. The wide range of manufacture extends from domestic electrical appliances to heavy electrical equipment. As an importer of heavy electrical plant and apparatus A.G.E. has the agency for most of the A.E.I. group companies.

Trade Announcements

Delapena & Son, Ltd., Zona Works, Russell Place, Cheltenham, are now marketing a range of vertical h.f. motor-generator induction heating units made by the Elektro-Maschinen concern. These machines range from 25 to 500 kW capacity and are suitable for the heating of steel billets for forging; deep case hardening of crankshafts, camshafts and tractor pins; and for metal melting. A brochure containing illustrated details of the machines is available.

A pilot plant is being set up in Canada for the manufacture of Hellermann sleeves and cable markers and other products, and Mr. C. E. D. Catley has arrived in Canada to superintend the work. A new company, **Hellermann (Canada), Ltd.**, is in course of formation.

The Service Department of the domestic appliance and television division, Liverpool, of the **English Electric Co., Ltd.,** has been transferred to Dunnings Bridge Road, Netherton, Liverpool, 10 (telephone: Liverpool Aintree 5201).

Catalogues and Lists

AIRPORT ELECTRIFICATION.—48-page illustrated booklet dealing with airport electrification including the general principles, lighting equipment, ground traffic control, power distribution, electrical services, etc.—**General Electric Co., Ltd.,** Magnet House, Kingsway, London, W.C.2.

BEARINGS.—Card folder, for use in the workshop, giving practical hints on the use of "Hoffman" ball and roller bearings.—**Hoffman Manufacturing Co., Ltd.,** Chelmsford, Essex.

INSULATING MATERIALS.—Folder describing the company's range of electrical insulating materials.—**Spicers, Ltd.,** 10, New Bridge Street, London, E.C.4.

The Electrical Industry's Part

B.E.A.M.A. Director Defends its Post-War Record

WE summarized in our last issue the paper entitled "The Electrical Engineering Industry in the Post-war Economy—II," by Mr. G. L. E. Metz, which was read at the Institution of Electrical Engineers on 3rd March.

Col. B. H. Leeson (director, British Electrical and Allied Manufacturers' Association), in opening the discussion, disagreed with the author that there was disquiet at the lack of cohesion that at times characterized the electrical industry. Speaking of the industry as a whole, he claimed that there was no other industry in the country which was more closely knit, a cohesion that was enhanced by the golden thread of the professional engineer which ran through the whole and synchronized all efforts to one common end.

He also criticized the statement that "our efforts" had failed and that the country was only just able to keep itself solvent, and said that instead of "our efforts" it would be truer to say "the country's efforts as a whole." He emphasized that within the convoy of progress the electrical industry could not go faster in certain directions than the general trend. Of all the industries which could pull the country out of its present state, the electrical industry was the best one to do so.

If one included in the engineering industries the metal-using and metal-producing industries, they were responsible for providing 51 per cent of the exports of the country as a whole, which gave point to the comment of the author that the electrical industry was one of the keys for all the other industries, and the engineering industry in particular.

Exports More Than Trebled

He drew attention to the training and educational problems involved in the fact that every year since the end of the war there had been an intake of 50,000 persons into the industry, and said that the industry now employed about 1,000,000 people. The industry's exports had risen by 3½ times in quantity since 1938. As to values, vehicles came first at £260 million, and the electrical industry second with direct exports at £220 million, or, with indirect exports as well, £250 million. Since 1948 the quantity of production achieved by the country had risen by one-third. He believed that that increase in production generally could never have come about had there not been the capital investment in the electricity supply programme and more electricity used in those industries.

Col. Leeson went on to say that the reports of the productivity teams which had visited America were good if they had stimulated increased production and enlightened personnel on what could be achieved if sufficient work was put in. On the other hand, there was a danger of the reports falling into the hands of the people to whom they were trying to sell their products, who might ask: "Why should we buy from a country when its own reports say that it is inefficient?" This country was not inefficient. The patterns of trade were entirely different in America and here; if comparable conditions in the two countries were taken, this country was in no way behind America. When electricity consumption per head was quoted, the difference in trades and industries between the two countries must be borne in mind. America had great aluminium plants with one or two operatives, and those plants had a huge consumption of electricity. On the other hand, Britain had much to do with arts, crafts and literature, which did not consume much electricity. From that point of view the two countries could not be compared.

He had made comparisons between firms in this country and in America engaged in electrical work, and had found that there was very little to choose between them. He doubted very much if there was more efficiency in motor car works in America than there was in the Ford works in England. Indeed, he had heard Americans say that more production was obtained from factories in this country than from factories in the United States. He agreed with the author that increased productivity was not the only solution. It all came down to more efficiency and, to put it bluntly, harder and longer work.

Looking Ahead

He disagreed with the author's comment that it was difficult to discern the objectives of the electrical engineering industry. Of all the industries that planned ahead, the electrical industry certainly did so. Its plans were out for ten years ahead, its factories were looking ten years ahead, and in the case of nuclear energy it was looking 50 years ahead. It had very clear objectives and certainly knew where it was going. The main objectives of the profession and the industry were to produce electricity for the benefit of humanity and to make the country stable so that it was solvent and could do good in the world.

To the author's statement that the demand for electrical equipment had far exceeded the capacity for producing it he would add "and the means for paying for it." Countries overseas had all kinds of projects in mind but were not yet in a position to pay for the electrical equipment that they wanted and this country had not been quite well enough off to be able to capitalize them to enable them to carry out the projects and buy our equipment. The fact that there might be a reversal of the situation ought also to be borne in mind. He agreed with the author that more research was needed, and also more capital. The author had commented on the slowness with which Britain had "cashed in" on her scientific discoveries, but he would point out that the electrical industry was on the verge of a nuclear energy programme which in the cost of its research and development was something that had never previously been faced.

He disagreed with the figure given by the author as the amount spent on research by the electrical industry, contending that it was at least £10 million or £12 million in the manufacturing industry. When one took into account the research carried out under the direction of the Government, the money for which came from industry through taxation, he felt that there was not the vast disparity in the amounts spent on research by Britain and America that there might at first sight appear to be.

He drew attention to the saving in coal which was being brought about by the installation of huge generating sets by the British Electricity Authority and the electrification of the railways, stating that the ultimate saving would be millions of tons.

The author had asked for suggestions as to how more might be got out of our resources, and he had one sugges-

tion to make. When there was very heavy capital equipment with more and more capital charges, it was necessary that the plant should work for a longer time. At the moment we were using it for only a short time, the people working during only one short period of the day and then for only five days a week. If the workers could be split into two shifts, it would be possible to get virtually the same output with half the capital equipment, which was what was happening in other countries. The keen competition that would be coming from Germany and Japan was even more real than the author had stated, and we should be up against it, but he felt sure that the nation would rise to it. He was absolutely convinced that the next half-century would see more spectacular advances in the development of the industry than there had been in the past. If they could fulfil their functions—to try to save as much as they could, create capital and improve the world—they themselves would be busy and solvent.

Mr. H. J. Beard (Merz & McLellan) said that because of the depletion of our capital resources the initiative in maintaining our overseas trade rested much more than it did previously on the British engineering industry. In that work the consulting engineer had a significant part to play in continuing to provide the export of technical services, which had in the past contributed to establishing the world market for British goods. The Government recognized the part played by consulting engineers in the export drive, and the recent White Paper on the nuclear power programme referred to the part which consulting engineers would play in training staff and assisting with the designs of the stations in the programme. By participating in the construction of schemes at home, consulting engineers obtained invaluable experience which they could use in their overseas work, and what was done at home provided a shop window for prospective clients from overseas.

Mr. R. Krzyczkowski calculated that in 1955 a rise of 8 or 9 per cent in production costs could be expected because of factors outside our control. Even now, our exports were not always competitive in price. With increasing foreign competition and a constant rise in productivity in America and Germany, it might be difficult, if not impossible, to pass the increases on to foreign customers. It might be concluded that the 8 or 9 per cent increase in production costs was the figure of the desired productivity increase, which was high but had been achieved by I.C.I. mainly through work study.

Mr. H. I. Scholar said that it was extremely dangerous to say, as the author had done, that exports would look after themselves and the door to new markets would open of its own account. On the contrary, the sooner one tried to open the door the less rusty the hinges would be, and the hinges of the doors to certain markets were already very rusty. He drew attention to the importance in relation to price in some cases of the high commission charged by overseas agents. Many such agreements were drawn up after the war when one was only too glad to be able to get an agent, but where business was being lost on this account some variation should be sought and the agent should be given the choice of having the business go elsewhere, or waiving the commission or accepting a nominal one.

Mr. E. A. Logan contended that there was no lack of ingenuity in this country in the development of domestic uses of electricity, but the development had been limited by restriction on maximum demand in the interests of manufacturing for export, restriction on capital and the need to extend electricity to farms.

Mr. Metz, replying to the discussion, said that much of the export problem was tied up with producing the right article at the right price. It was extraordinary how it eased one's path if one had a really good article which was about 30 per cent cheaper than the next man's.

The President suggested that if the executives organized their lives properly, they would be able to do as much work as they did now and yet leave 50 per cent of the executive side free to concentrate on the export drive. The fact that the country had to stand on its own feet more than in the past might not be a bad thing on the whole, for in the future it would achieve the success that it deserved.

Toronto Underground Railway

THE electrical equipment of the Toronto Subway, the first underground electric railway in Canada, was described in a paper presented last evening at the Institution of Electrical Engineers by Mr. F. W. Roberts (Bepco Canada, Ltd., Canadian representatives of the Gloucester Railway Carriage & Wagon Co.). The Subway was opened on 30th March last year and was the subject of an article in the *Electrical Review* of 30th April, 1954. The rolling stock was designed and built in England to the order of the Toronto Transit Commission.

Two lines have been constructed, both having a route length of 4½ miles with ten intermediate stops. One, from north to south, is designed to cope with a peak traffic of 40,000 passengers/hr at 17·5 m.p.h. and the other from east to west for 15,000; the latter is being initially operated with street cars.

The track is fed from five 5 or 2·5 MW substations containing pairs of 1·25 MW six-phase mercury-arc rectifiers (giving the effect of twelve-phase), by which the incoming 13·5 kV 60 c/s supply is converted to 600 V. The line conductor rail (150 lb/yd) of the third-rail system has a copper equivalent of 1·96 sq in and the running rails (100 lb/yd) of 0·785 sq in. Only one running rail is used for return of the power current, the second being reserved for signalling circuits. Two top-running shoe collectors are mounted on each bogie, but no power busbar is carried through the trains.

Automatic colour signalling for a maximum headway of 40 trains an hour is supplemented by automatic trackside train stops, but at depots and yards operation of points and signals is done by signalmen. Trains normally consist of eight cars, each with 62 seats and a driving cab. The cars are equipped alternatively with a 4 kW motor-generator giving 50 V and a 96 Ah (five-hour rate) battery or with a motor-driven air compressor, thus permitting the operation of two cars as a unit.

Each bogie carries a pair of cardan-shaft-drive traction motors and 52:7 right-angle hypoid gearing, a layout that removes the unsprung weight of the motors from the axle and reduces their weight and size, making for better riding qualities and quieter running. The four motors have a total continuous rating of 224 h.p. at 60 per cent field strength and a one-hour rating of 272 h.p. Acceleration averages 2·3 m.p.h./sec on level track up to 12·5 m.p.h. (the average gradient is 1 in 90 and the maximum 1 in 30); two stages of field weakening follow. Average accelerating current is 4,800 A for an eight-car train.

All major control items are electro-pneumatic and

housed in one case mounted beneath the car underframe, thus reducing external connections to ten cables and one air-pipe. This compact arrangement permits the inclusion of 18 steps from start to full parallel running, which secures smooth acceleration up to the highest value that is practicable without initiating wheel slip. The use of a camshaft eliminates most of the usual progressive interlocks, reducing maintenance. An individual current relay in each car gives inherent compensation for variations in traction-motor characteristics and in tyre diameters.

The starting resistance is cut out in stages by cam-operated contactors, the camshaft being driven by rack-and-pinion gearing under the influence of two opposed pistons, one responding to air pressure and one to oil pressure, controlled by a single magnetically operated valve. The camshaft is moved in one direction of rotation when the motors are in series and in the other direction when in parallel; this effects a quick transition from series to parallel and, since the full-parallel and the start positions are the same, allows rapid restarting of the trains. Moreover when a gap in the conductor rails causes the opening of the line breaker, all resistance is already inserted before reconnection of the motors.

For heating 3 kW is necessary in each car to maintain 60 deg F when the air outside is at 10 deg F. Built-in capacity is 7 W/ft³ compared with the usual 2 to 3½ W in Britain and 4½ W in France. A pair of fans driven by a single 50 V 1 h.p. motor delivers 2,000 ft³/min of air, which is drawn over three 600 V thermostatically controlled resistors. Lighting is by forty-seven 48 W 30 V lamps per car of which six are battery fed, two in series, and 41 are fed from the 600 V system in two series.

Rhodesia and Nyasaland Electrical Trade

THE growing need of the Federation of Rhodesia and Nyasaland for power and for communications makes electrical equipment a highly important group of imports, of which the United Kingdom has so far been much the biggest supplier. In his report (dated May, 1954) on the economic and commercial conditions in the Federation,* however, Mr. H. W. Woodruff (United Kingdom Trade Commissioner at Salisbury, Southern Rhodesia), draws attention to the strong bid by Continental firms to enter the market. He states that their quotations are frequently much below those of United Kingdom concerns and their attractiveness to authorities seeking to implement plans for expansion with limited funds is not small.

Mr. Woodruff gives figures of electrical imports for 1952 and 1953 into Southern and Northern Rhodesia, showing the United Kingdom's dominant position in these markets. These are set out in the accompanying table.

IMPORTS OF ELECTRICAL EQUIPMENT

	Southern Rhodesia			Northern Rhodesia		
	Total	United Kingdom	South Africa	Total	United Kingdom	South Africa
	£ (000)	£ (000)	£ (000)	£ (000)	£ (000)	£ (000)
Transformers:						
1952	358	327	21	147	142	—
1953	575	561	13	251	247	—
Electric motors and parts:						
1952	277	192	55	196	167	23
1953	246	165	63	235	175	35
Batteries:						
1952	304	182	100	131	69	52
1953	193	92	88	147	61	67
Other electrical machinery:						
1952	1,286	1,108	96	770	665	72
1953	1,050	942	80	1,262	1,104	123

Imports of batteries into Southern Rhodesia have fallen away since local production started about two years ago. Telegraph and telephone material and instruments is a good example of a class of imports where the United Kingdom has supplied nearly everything (£314,969 to Southern Rhodesia and £189,834 to Northern Rhodesia in 1953) but where the position may change. A large order for telephone exchange equipment went to Sweden on price grounds at the beginning of 1954 and a smaller one went mainly to the Netherlands at about the same time.

Radio telegraphy and telephony material and instruments (including radio receivers) is a group where in Southern Rhodesia the United Kingdom's share of trade fell away in 1953, due to a larger proportion of radiograms bought from the Union of South Africa. Radio telegraphy and telephony materials and instruments to the value of £510,000 were imported into Southern Rhodesia in 1953 (against £470,000 in 1952) of which the United Kingdom supplied £305,000 (£333,000) and South Africa £143,000 (£78,000). Imports into Northern Rhodesia of radio apparatus, appliances and parts in 1953 totalled £232,000 (£198,000 in 1952), the United Kingdom's share being £162,000 (£143,000) and South Africa's £31,000 (£22,000).

Cable and wire to a total value of £1,045,939 was imported into Southern Rhodesia in 1953 and of this the United Kingdom supplied £449,338 and South Africa £428,571. Northern Rhodesia imported cable and wire to a total value of £982,532 in 1953, the United Kingdom's share being £516,598 and South Africa's £441,232. With the further development of cable and wire making, both locally and in South Africa, it seems likely that United Kingdom trade will fall away still further.

Large imports of boilers and parts and boiler tubes, £1,224,410 into Southern Rhodesia and £739,045 into Northern Rhodesia, in 1953 came almost entirely from the United Kingdom. The trade in machine tools is not a large one. Southern Rhodesia offers the best prospects, her imports amounting to £149,304 in 1953, of which the United Kingdom supplied tools to the value of £121,781.

A supplement at the end of Mr. Woodruff's report brings the trade statistics given in the main body of the survey more up to date. This shows that electrical machinery imports for the first nine months of 1954 totalled £3·4 million, of which the United Kingdom supplied £2·2 million. The total of imports of electrical goods and apparatus (not machinery) for the same period amounted to £3·2 million and of this the United Kingdom supplied £2·0 million.

Mr. Woodruff deals at some length with the development of electricity supply in the Federation and includes figures showing the installed capacity of the more important power stations and distribution. Reference is also made to the Kafue and Kariba hydro-electric schemes (see page 375).

*H.M. Stationery Office, price 5s net.

The *Financial Times* reports that Mr. J. H. Lascelles, executive vice-president of the Rhodesian Selection Trust, has resigned from the Federal Hydro-Electric Board of which he was temporary chairman. His reason is the Federal Government's decision to proceed with the Kariba scheme before that at Kafue and he says that he has reason to believe that the cost of the former scheme has been underestimated and that of the Kafue scheme over-estimated. He contends that while the potential outputs of the two schemes are about equal the Kafue scheme would be slightly cheaper to carry out. Moreover Kafue could be constructed in four easy stages, making the phasing of finance easier and relating construction to the demand for power.

Financial Section

STOCKS and SHARES

ALTHOUGH continuing to behave with a good deal of irregularity, Stock Exchange markets have made, on balance, good progress towards recovery from the effects of last month's Bank Rate shaking. By the beginning of this week, the appearance of markets was still chastened—in comparison with the conditions of a month or two previously—but dull rather than depressed. As a reaction to the rise in Bank Rate, the improvement of sterling against the dollar was taken as encouraging, although it was agreed, of course, that the effectiveness of the Chancellor's stand against inflation will emerge only by degrees. Industrial shares have again taken their cue mainly from the gilt-edged market, but as the flow of company dividend announcements and financial results for 1954 begins to quicken, individual features become more frequent.

Electrical Equipment Shares

Movement of share prices has tended to become less erratic, but the day-to-day changes are still too frequent to permit much comment in detail upon the many alterations in the accompanying lists. Speaking generally, however, it may be noted that the extent of the rally is in some cases as much as 5s per share, and that recoveries of two or three shillings are common. Many quotations moved up to levels equal to the best of those recorded last year, though still below the peaks registered more recently. Popular radio shares have been especially prompt to recover earlier losses. Shares such as Parsons, Reyrolle, Ericssons, Chloride Electrical and I.C.I. reflected a revival of keen interest in the many company results due to appear during the next month or two.

Telegraph Condenser Results

The Telegraph Condenser Company's 10s shares were marked up by 3s 9d, to 45s, following the final dividend declaration, which makes for 1954 a total of 25 per cent on capital doubled by last year's scrip issue. Allowing for that the distribution is being raised in effect by 10 per cent. It carries a stage further one of the most striking post-war records in the electrical equipment group of companies, for it is the fifth successive rise to be made in the dividend, without any departure from conservative principles. During this period the issued ordinary capital has been raised from £150,000 to £600,000 by successive capitalizations of reserves. According to the provisional statement, earnings for the latest year permit the appropriation of a further £110,000 to reserves after payment of tax and dividends. The yield on the shares now works out at slightly over 5½ per cent.

A.E.I. Results

The preliminary profits statement of Associated Electrical Industries, pub-

Week's Price Changes

Company or Board	Nom. Value	Middle price 7th Mar.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	88½		3	3	3 7 10	97	88⅞
Brit. Elec. 1974/77	100	87½		3	3	3 8 7	96½	87½
Brit. Elec. 1976/79	100	92½		3½	3½	3 15 8	101½	93 7/16
Brit. Elec. 1974/79	100	102½		4½	4½	4 3 0	111½	103 5/16
Overseas Electric Supply								
Calcutta Elec.	£1	21/-		6†	6†	5 14 3†	24/6	18/7
East African Power	£1	21/-	+6d	7	7	6 13 4	23/4	19/6
Nigerian Elec.	£1	26/6		10	10	7 11 0	25/-	23/6
Palestine Elec. "A"	£1	22/-		Nil	Nil	—	21/-	16/-
Perak Hydro-Elec.	£1	18/-	−6d	6	10	11 2 3	20/-	13/9
Equipment and Manufacturing								
Aberdare Cables	5/-	12/6	+6d	25	12½*	5 0 0	14/3	8/1
Aerialite	1/-	6/-	+6d	88⅜	88⅜	7 7 3*	14/6	10/9
Allen, W. H.	£1	79/6		15	20	5 0 8	78/6	50/-
Aron Elec. Ord.	£1	57/6	−1/3	20	15	5 4 4	60/-	43/-
Assoc. Elec. Ord.	£1	68/9xd	+3/6	11¼	14	4 1 6	62/6	41/6
Automatic Tel. & El.	£1	72/6		15	15	—	73/-	57/3
Babcock & Wilcox	£1	75/-	+1/3	18	12*	3 4 0	76/3	47/3
Baldwin, H. J.	2/-	4/9xd	+3d	20	20	8 8 6	5/6	3/9
Bakelite	10/-	30/-		12½	16	5 2 7	32/-	23/6
British Aluminium	£1	39/-	+2/-	12	10	5 5 3	41/-	33/9
B.I. Callender's	£1	50/-	+1/3	10	10	4 0 0	52/-	37/9
B.I. Callender's 6% Pref.	£1	24/6	+9d	6	6	4 18 0	26/6	24/3
British Thermostat	5/-	23/9		35	27½*	—	28/-	12/-
British Vac. Cleaner	5/-	15/6		15	25	8 1 3	14/6	11/6
Brook Motors	10/-	41/3		20	20*	—	45/6	29/3
Brush Ord.	5/-	8/9	+6d	4	6	3 8 7	8/3	3/6
Bulgin, A. F.	1/-	5/-	+6d	30	30	6 0 0	4/3	3/2
Burco	5/-	20/-	−2/6	35	25*	6 5 0	21/6	12/1
Chloride El. Storage "A"	£1	63/9	+3/3	20	12½*	3 18 6	68/6	46/6
Clarke Chapman	£1	77/6xd	+3/3	20	20*	5 3 3	73/-	47/6
Cole, E. K.	5/-	22/6	+3/3	25	27½	3 1 3*	20/-	11/6
Cossor, A. C.	5/-	9/6	+3d	10	10	5 5 3	11/-	7/-
Crabtree	10/-	31/3xd		17½	20	6 8 0	32/-	23/9
Crompton Parkinson Ord.	5/-	17/6		20	20	—	17/9	11/6
De La Rue	5/-	21/-	+3d	Nil	20	4 15 3	24/-	12/3
Decca	4/-	54/6	+5/9	35	56¼*	4 2 6	56/6	32/-
Desoutter	5/-	26/3xd		20	25	4 15 3	26/6	16/1
Dewhurst	2/-	7/9	+3d	19	24	6 3 9	7/6	5/1
Dictograph Tel.	2/-	7/-	+6d	20	20	5 14 3	8/-	5/2
Dubilier Condenser	1/-	5/-	+9d	25	25	—	5/3	3/3
E.M.I.	10/-	32/-	+3/3	8	10	3 2 6	27/9	11/3
Electrical Components	5/-	15/9		20	20	6 7 0	16/3	10/9
Elec. Construction	£1	33/9	+1/3	15	15	4 9 0*	35/-	26/6
Enfield Cable Ord.	£1	22/6	+1/3	5	Nil	Nil	26/3	16/6
English Electric	£1	66/3xd	+2/-	10	12½	3 15 6	59/-	38/-
English Electric 3¾% Pref.	£1	15/6	+1/-	3¾	3¾	4 16 9	16/9	15/3
Ericsson Tel.	5/-	33/6	+2/6	22†	25†	1 17 4†	33/9	22/9
Ever Ready	5/-	24/6	+9d	35	40	—	26/3	17/9
Falk Stadelmann	£1	46/3	−1/3	15	15	6 9 9	49/-	36/6
G.E.C. Ord.	£1	53/9xd	+6d	11¼	12½	4 13 0	60/-	37/6
G.E.C. 6½% Pref.	£1	26/3	+1/3	6½	6½	4 19 0	28/9	26/6
General Cables	5/-	16/9		20	30	8 19 0	18/-	16/3
Greenwood & Batley	£1	55/-		17½	17½	6 7 3	55/-	40/3
Hackbridge Cable	5/-	14/9	+9d	20	20	6 15 7	15/9	11/3
Hackbridge & Hewittic	5/-	25/-	−1/3	20	25	5 0 0	25/-	16/1
Hall Tel. Acc.	10/-	12/3	+6d	10	10	8 3 3	13/-	10/6
Heatrae	2/-	4/9	−3d	12½	12½	5 5 3	5/6	4/-
Henley's	10/-	19/6	+6d	10½	10½	5 7 9	22/-	15/6
Holophane	5/-	18/3		20	25	6 17 0	18/-	13/1

* After capital bonus. † Free of income tax.

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

listed on the first day of this month, helped to put the £1 shares in the van of the recovery from the previous upset, during which they were marked down at one time to 63s. A rebound to 70s took the quotation to within about 4s of its all-time best. It was marked ex-dividend at 68s 9d. Like English Electric, the company had already anticipated the final dividend declaration, which had been forecast as 10 (making a total for the year of 14) per cent in connection with the offer of Siemens Bros. publicly-held shares, virtually all of which are now owned by A.E.I. The latter's new ordinary shares given in exchange for those of Siemens do not, incidentally, participate in the above-mentioned dividend, but from now on, rank equally with the old shares in that respect.

in Electrical Investments

Company or Board	Nom. Value	Middle price 7th Mar.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1954 Highest	1954 Lowest
Equipment and Manufacturing—continued.						£ s d		
Hoover	5/-	48/9	−1/3	45	70	7 3 6	51/-	26/3
I.C.I.	£1	42/-	+1/6	13	15	3 11 5	43/6	26/6
Intl. Combustion	5/-	26/-xd	+6d	20	25	4 11 0	30/-	14/6
Johnson & Phillips	£1	49/-	+1/-	15	15	6 2 6	52/6	45/6
Lancashire Dynamo	£1	58/9	−1/3	12½	14	4 15 3	59/6	43/-
Laurence, Scott	5/-	15/6	+6d	15	20	3 4 6*	4/9	7/-
Lister, R. A.	£1	33/9		12	9·3*	5 10 0	33/-	22/6
London Elec. Wire	£1	53/3	+3d	15	10*	3 15 0	54/-	38/-
Lucas, J.	£1	44/6	+9d	10·8	7½*	3 7 5	49/-	25/3
Marryat & Scott	2/-	9/6		22½	25	5 5 3	9/6	5/11
Mather & Platt	£1	59/-xd	+1/3	15	13·4*	4 14 9	53/-	32/-
Metal Industries	£1	32/-	+6d	12	9	5 12 6	42/3	29/6
Midland Elec. Mfg.	£1	45/-	+1/3	15	15	—	43/9	31/6
Morphy-Richards	4/-	27/6	+1/3	40	35*	5 1 9	27/6	11/4
Murex	£1	51/3	+1/3	15	15	5 17 0	57/-	49/-
Newman Ind.	2/-	3/-	−3d	10	10	6 13 4	2/6	2/-
Oldham & Son	1/-	3/3	+3d	17½	17½	5 7 8	3/4	2/5
Parnall (Yate)	5/-	10/3	+1/3	6	8	3 18 0	11/-	4/3
Parsons, C. A.	£1	62/6	+5/-	12½*	7½*	2 8 0	60/-	38/1
Plessey	10/-	63/9	+1/3	30	20*	3 2 9	64/-	37/10
Pye Deferred	5/-	33/6	+4/9	20	20*	2 19 9	37/-	15/7
Revo	10/-	13/6		27½	9*	6 13 3	20/3	14/-
Reyrolle	£1	93/9	+1/3	12½	13¾	2 18 8	92/6	66/-
Rheostatic	4/-	15/6		19	20	5 3 3	15/9	11/-
Richardsons Westgarth	5/-	13/9	+6d	15	15*	5 9 0	12/3	6/6
Scottish Cables	4/-	20/-		20	27½	5 10 0	21/9	12/1
Smith (England), S.	4/-	16/6	+9d	15	17½*	4 4 9	17/6	7/8
Southern Areas	£1	29/6	+1/-	6	7½	5 1 9	32/6	17/6
Strand Elec.	5/-	9/6	+9d	17½	17½	9 4 3	10/3	8/3
Sturtevant	5/-	23/9		18·1†	18·9*†	—	22/9	14/6
Sun. Elec.	£1	33/9		15	15	8 17 9	33/9	27/6
Switchgear & Cowans	5/-	16/6	+1/3	22½	10	3 1 1	13/7	9/9
Taylor Tunnicliff	5/-	13/9	+1/-	12½	15	5 9 0	12/4	10/7
T.C.C.	10/-	45/-	+3/9	30	25*	5 11 0	41/3	21/3
T.C. & M.	£1	37/-	+1/3	10	8½*	4 12 0	37/6	30/3
Telephone Mfg.	5/-	10/-	+6d	10	10	5 0 0	9/6	7/6
Thorn Elec.	5/-	31/3	+2/6	12½	20	3 4 0	30/6	13/3
Thornycroft	£1	40/-	+5/-	15	15	—	39/6	26/6
Tube Investments	£1	80/-	+5d	15	17½	4 7 6	81/3	60/3
Vactric	5/-	33/9	+1/3	Nil	10	2 19 3	24/6	7/6
Veritys	5/-	7/6		10	12½	8 6 9	10/6	5/-
Walsall Conduits	4/-	52/6		70	70	5 6 8	52/6	44/-
Ward & Goldstone	5/-	38/9	+1/3	45	50	—	43/6	21/-
Watford	2/-	6/9	−3d	25	22½*	—	7/3	4/7
Westinghouse Brake	£1	95/-	+1/3	16	18	3 15 9	86/3	60/9
West, Allen	5/-	13/6		15	17½	—	19/6	12/7
Wolf Electric	5/-	18/3		15	17½	4 16 0	17/6	11/-
Trusts, Transport and Communications								
Anglo-Am Tel.:								
A. Ord.	100	81		6	6	7 8 3	89½	80
Ord.	100	52½		3¾	3¾	7 2 10	55½	52/-
Anglo-Portuguese	£1	21/6		8	8	7 8 9	25/9	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	21/6		35	50	—	24/-	13/-
Cable & Wireless:								
Ord.	£1	42/6		9	10	4 14 1	42/9	26/2
4% Loan	100	97½	+4½	4	4	4 2 0	98½	95½
Calcutta Trams	£1	20/6		2½†	6†	5 17 0†	24/6	17/1
Cape Elec. Trams	£1	17/-		5½	7	8 4 9	17/6	12/4
Marconi Marine	£1	35/-xd	+1/-	10	10	5 14 3	35/-	27/6
Oriental Tel. Ord.	£1	97/-		16	16	—	101/3	82/6
Telephone Props.	£1	80/-	−2/6	—	—	—	92/6	74/6
Telephone Rentals	5/-	10/-	+6d	10	10	5 0 0	11/-	9/-

Increased Earnings

Trading profits of £11·7 million by the A.E.I. group show an expansion of just short of a million, or 9 per cent, as compared with those of 1953. Since in that year the group was liable for a contribution of no less than £1·3 million to the now defunct excess profits levy, the improvement in the net surplus after tax is proportionately larger, being, in fact, half as much again as the corresponding previous figure. The taxed profit of £4½ million is struck after heavy extra depreciation deductions, and still covers well over three times the net amount distributed in ordinary dividend. It is this wide margin of dividend safety, as well as the great financial strength and potentialities of the group in other respects, which accounts for the quotation of the shares on a yield basis somewhat below the present return of 4·2 per cent shown by War Loan.

Recent Issues

Payment in full for G.E.C.'s new ordinary shares fell due a week ago, and with the consequent easing of pressure to sell the "rights" the price tended to harden. Shares will remain available free of stamp until mid-April. There was some recovery also in the same company's 4 per cent loan stock, the issue of which fell foul, last month, of the change in interest rates and inevitably went largely into the hands of the underwriters. After an opening discount of 5 points, the price is now 3 points under the issue price of 100. In the case of E.M.I.'s recent issues, which suffered in the same way, the 4 per cent loan stock and 5½ per cent preference shares have been changing hands at discounts of, respectively, a point and a shilling on the offered prices of 100 and 20s 6d.

Other Company News

Bakelite's latest annual results show an emphatic recovery from the effects of the general plastics recession of the previous year. Group profits appear to be not much short of doubled, so that, although the tax charge is a great deal heavier, the company is able to raise the dividend from 12½ to 16 per cent, which takes £132,000 from the net surplus of £321,000. Following the announcements, the 10s shares were dealt in about 9d above the official quotation of 30s. International Combustion 5s shares were also very firm on news of the company's £10 million contract for the British Electricity Authority. In the market they were called 1s higher at 27s.

REPORTS and DIVIDENDS

Bruce Peebles & Co., Ltd.—The accounts for 1954 now issued show a trading profit of £448,516, as compared with £423,726 for 1953, and after meeting all charges, including £230,000 for taxation, the net balance is £203,700 (against £136,256), to which is added £34,427 brought in and £30,000 provision for taxation not now required, making £268,127. Reserves receive £157,793, and as already announced, it is proposed to pay an ordinary dividend for the year of 15 per cent and a bonus of 10 per cent, making 25 per cent (same) on doubled capital. The balance carried forward is £58,635.

In his statement which is included with the report and accounts, Sir William Y. Darling (chairman) says that although the high level of output during the year under review has been maintained, the total value of orders on the books now exceeds £4,000,000, a higher total than at the end of 1953. The work in progress has changed. Orders received during the year were generally for larger units than those supplied in 1954. Among the projects for which orders have been received are Altnabreac (an alternator for the first peat-fired gas turbine in the United Kingdom), Dalchonzie and Lubreoch (water turbines and generators for the Breadalbane scheme), Clydes Mill (large transformers for the supergrid), and the Dolgarrog generator.

The Telegraph Condenser Co., Ltd., reports a trading profit of £473,682 for 1954, as compared with £460,897 for the previous year, which with interest and dividends, makes £482,224. Taxation requires £216,665, and it is proposed to pay a final ordinary dividend of 20 per cent, making 25 per cent for the year (against 30 per cent), on capital doubled by a scrip issue. General reserve receives £110,000, and the balance carried forward is £96,114 (against £92,781 brought in).

Bakelite, Ltd.—The preliminary statement for 1954 shows a group profit of £648,829, as compared with £332,367 for the preceding year. Taxation absorbs £278,127 and the net balance is £320,702 (against £252,749). It is proposed to pay a final dividend of 11 per cent (against 9½ per cent), making 16 per cent for the year (12½ per cent).

Thomas Bolton & Sons, Ltd., report a provisional trading profit for 1954 of £354,635, as compared with £381,819 for the preceding year, and after providing £180,530 for taxation, the net profit is £60,841 (against £245,138). It is stated that the annual adjustment of the valuation of base stock for tax purposes for 1953 (taxation charged was £22,390) created a distortion of United Kingdom tax charges in relation to trading profits. No allocation is made to general reserve (against £150,000). The final ordinary dividend is maintained at 7½ per cent, but the 1953 2½ per cent bonus is omitted, and the total distribution for the year is therefore 10 per cent (against 12½ per cent). The balance carried forward is £185,379 (against £183,192 brought in).

Taylor, Tunnicliff (Electrical Industries), Ltd., in a preliminary statement, reports a group profit and sundry income for 1954 of £369,972, as compared with £316,863 for 1953. After deducting £203,891 for taxation and £3,272, proportion of profit applicable to outside shareholders of a subsidiary, the net balance is £162,809 (against £146,636), from which is deducted adjustments relating to previous years of £11,824, making £150,985. It is proposed to pay an ordinary dividend for the year of 15 per cent (against 12½ per cent), and to carry forward £382,161 (against £306,725 brought in).

Brown Brothers, Ltd.—The group net profit for 1954, according to a preliminary statement, is £309,103, as compared with £230,000 for 1953. The profit is struck after providing £412,269 for taxation. General reserve receives £150,000 and it is proposed to pay a final dividend of 12½ per cent (against 11½ per cent), making 15 per cent for the year (14 per cent).

The company has acquired the share capital of Wood & Cairns, Ltd., electrical and radio wholesalers of Edinburgh, Dundee and Glasgow. We understand from Brown Brothers that Mr. J. E. Lamb has resigned as managing director of Wood & Cairns, Ltd., but remains on the board. There are no other changes in the management or staff of the company, which will continue in the same way as it has done for many years. Mr. W. S. Thain continues as director and general manager.

Associated Electrical Industries, Ltd., announces a net profit available for distribution for 1954 of £4,512,589, as compared with £2,933,264 for 1953. After certain adjustments the balance available for appropriation by A.E.I. is £2,385,408 (against £1,786,266) and to this is added a balance of £272,290 brought forward making £2,657,698 (£2,005,400). From this £500,000 is transferred to general reserve (same), and capital duty and issue expenses are written off. Full payments have been made on the preference stocks and 4 per cent has been paid on the ordinary stock. A final ordinary dividend of 10 per cent, making 14 per cent for the year (against 15 per cent partly on smaller capital).

The report says that the factories of the group attained record levels in value and volume and in spite of increased foreign competition there was a substantial increase in export orders. Reference is made to the constitution of the operating companies in four groups and to the acquisition of Birlec, Ltd. As in previous years, an amount has been set aside additional to the normal depreciation charge to provide for the increased cost of renewing or replacing plant. The report concludes with a reference to the return of Lord Chandos (formerly Mr. Oliver Lyttelton) to the chairmanship of the company and to other changes in the board during the year.

The General Electric Co., Ltd.—While 92·5 per cent of the issue to stockholders of £6 million 4 per cent unsecured loan stock, 1975-80, was left with the underwriters, it is announced that acceptances under the rights issue of 1,959,240 £1 ordinary shares at 48s a share totalled 1,813,000 shares. At the same time there were "excess" applications for 1,663,000 shares.

New Companies

Charles Colston, Ltd.—Registered 2nd March. Capital £100. Manufacturers, importers and exporters of and dealers in articles, apparatus, utensils, commodities and equipment of a household, domestic or personal nature; electrical, mechanical and general engineers, etc. The subscribers are: C. B. Colston and M. Colston. The first directors are not named. Solicitors: Bristows Cooke & Carpmael, 1, Copthall Buildings, E.C.2.

Kingston Control Systems, Ltd.—Registered 12th January. Capital £8,000. Consultants and advisers on all matters pertaining to fuel efficiency and fuel technology, to supply and install equipment, appliances and systems of heating, refrigeration and air conditioning plant, together with automatic controls, etc. Directors: A. H. de Roemer, A. S. Hollamby and C. F. Ide. Regd. office: Empire Chambers, Richmond Road, Kingston-on-Thames.

Increases of Capital

Metropolitan-Vickers Electrical Co., Ltd.—Increased by £418,250, in £1 ordinary shares, beyond the registered capital of £6,000,000. The increase is for the purpose of acquiring the undertaking of Newton Victor, Ltd., and Newton & Co., Ltd.

Edmundsons Construction Co., Ltd.—Increased by £49,900, in £1 ordinary shares, beyond the registered capital of £100. The increase is for the purpose of acquiring part of the undertaking of Edmundsons Electric Co., Ltd.

Bankruptcies

C. J. Callander, 60, Beverley Way, West Wimbledon, London, S.W.20, electrical and hardware merchant.—Receiving order made 23rd February on a creditor's petition.

H. Turner, 20, Battersea Rise, Clapham Common, London, radio and electrical contractor.—Supplemental dividend of 5⅞d in the £, payable at the Official Receiver's office, 58-61, York Terrace, Regent's Park, London, N.W.1.

NEXT WEEK'S EVENTS

Organizers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 231, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

Monday, 14th March

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.E. South Midland Supply & Utilization Group. "Repairing Electrical Plant," by J. Ashmore.

BRISTOL.—S.W.E.B., Colston Avenue, 6 p.m. I.E.E. Western Supply Group. "Supply to Industry," from the point of view of the consumer by R. H. Cobbold; the commercial engineer by W. P. Warren; and the distribution engineer by J. S. Lombard.

LEICESTER.—Demonstration Theatre, Electricity Offices, Charles Street, 7 p.m. Leicester Electrical Society. "Interference Suppression," by A. Hale.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 7.15 p.m. Incorporated Plant Engineers, Merseyside & N. Wales Branch. Annual general meeting.

LONDON.—St. Ermins Hotel, Caxton Street, 7 p.m. A.S.E.E. Central London Branch. "Space Heating by Electricity."

At the Institution of Civil Engineers, Great George Street, 6.30 p.m. I.E.E. London Students' Section. "Air Transportation," by Sir Miles Thomas. (Joint meeting with the London Students and Graduates of the Institutions of Civil and Mechanical Engineers.)

NEWCASTLE-UPON-TYNE. — Neville Hall, 6.15 p.m. I.E.E. North-Eastern Centre. "Automatic Circuit Reclosers," by G. F. Peirson, A. H. Pollard and N. Care.

READING.—George Hotel, 7.15 p.m. I.E.E. district meeting. Open forum.

STAFFORD.—At the English Electric Co.'s Lecture Room, Salt Avenue/Sabine Street, 7.15 p.m. I.E.E. North Staffs. Sub-Centre, Students' Section. Short papers evening.

Tuesday, 15th March

BRADFORD.—Technical College, 6.30 p.m. I.E.E. North Midland Centre. "Colour Television," by Dr. G. N. Patchett.

CAMBRIDGE. — Cambridgeshire Technical College, 6 p.m. I.E.E. Cambridge Radio Group. "A Caesium Clock," by J. G. Yates.

DERBY.—E.M.E.B. Service Centre, 6.30 p.m. I.E.E. East Midland Centre. "The Possibilities of a Cross-Channel Power Link between the British and French Supply Systems," by D. P. Sayers, M. E. Laborde and F. J. Lane.

EDINBURGH.—Carlton Hotel, North Bridge, 6.30 p.m. I.E.E. South-East Scotland Sub-Centre. "The Genesis of the Thermionic Valve," by Prof. G. W. O. Howe; "Thermionic Devices from the Development of the Triode up to 1939," by Sir Edward Appleton; and "Developments in Thermionic Devices since 1939," by Dr. J. Thomson.

LIVERPOOL.—9, The Temple, 24, Dale Street, 6.30 p.m. I.E.S. Liverpool Centre. Members' night: Four short papers, by W. B. Parkinson; J. R. Parker; G. E. Shepherd; and J. A. Watson and C. G. Lloyd.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurements Section. "The Mechanism of Sub-harmonic Generation in a Feedback System," by Dr. J. C. West and J. L. Douce; and "The Transient Behaviour of Remote-Position-Control Systems with a Hard Spring Non-Linear Characteristic," by Dr. J. C. West and F. N. Nikiforuk.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Utilization Group. "Standardization of Retail Electricity Tariffs," by A. O. Johnson and N. F. Marsh.

Engineers' Club, Albert Square, 7.15 p.m. Incorporated Plant Engineers, Manchester Branch. Annual general meeting.

Tuesday, 15th March, to Saturday, 19th March

LONDON.—Earls Court. Electrical Engineers' (A.S.E.E.) Exhibition.

Wednesday, 16th March

BRISTOL.—Grand Hotel, 7.15 p.m. Incorporated Plant Engineers, Western Branch. Annual general meeting, followed by films.

FARNBOROUGH.—R.A.E. Technical College, 7.30 p.m. I.E.E. Southern Centre. "A Transatlantic Telephone Cable," by Dr. M. J. Kelly, Sir W. Gordon Radley, G. W. Gilman, and R. J. Halsey.

LEEDS. — Hotel Metropole, 7.30 p.m. Institution of Heating and Ventilating Engineers, Yorkshire Branch. Annual general meeting followed by lecture on "Boiler Feed-Water Treatment," by D. Billingham.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Supply Section. "An Examination of High-Voltage d.c. Testing Applied to Large Stator Windings," by R. T. Rushall and J. S. Simons.

At the Institution of Mechanical Engineers, Birdcage Walk, 6 p.m. Institution of Heating and Ventilating Engineers. "Some Experiments on Floor Heating by Means of a Heat Pump," by J. P. Sumner.

Connaught Rooms, W.C.2, 6 for 6.30 p.m. Batti-Wallahs' Society. Ladies' night.

Pepys House, 14, Rochester Row, 6.30 p.m. Institution of Heating and Ventilating Engineers, London & District Associate Members' and Graduates' Section. "Electricity in the Plant Room," by M. V. Ferrier.

MANCHESTER. — Engineers' Club, Albert Square, 6.45 p.m. I.E.E. North-Western Radio Group. "Artificial Reverberation," by Dr. P. E. Axon, C. L. S. Gilford and D. E. L. Shorter.

Engineers' Club, Albert Square, 7 p.m. A.S.E.E. Manchester Branch. "Transducers and their Application to Industry," by T. H. Halstead.

Engineers' Club, Albert Square, 6.45 p.m. Women's Engineering Society, Manchester Branch. "Refrigeration," by J. S. Porter.

MIDDLESBROUGH.—Cleveland Scientific & Technical Institute, Corporation Road, 6.30 p.m. I.E.S. Tees-Side Group. "Studies in Interior Lighting," by J. M. Waldram.

NOTTINGHAM. — E.M.E.B., Smithy Row, 7.30 p.m. A.S.E.E. Nottingham Branch. Annual films evening.

PRESTON.—N.W.E.B., 19, Friargate, 7.15 p.m. I.E.S. North Lancashire Group. "Simple Measurement of Radiant Energy and the Calibration of Light Sources," by H. W. Cumming. (Joint meeting with the A.S.E.E. Preston Branch.)

ROCHESTER.—Bull Hotel, 7 p.m. Incorporated Plant Engineers, Kent Branch. "Industrial Lighting," by J. F. Roper.

RUGBY.—College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Students' Section. Students' Lecture: "Communication of Information—Human, Animal and Machine," by Dr. E. C. Cherry.

WIMBLEDON.—Guild House, 32, Worple Road, 8.15 p.m. A.S.E.E. South-West London Branch. Film evening.

Thursday, 17th March

BIRMINGHAM.—Imperial Hotel, 6.30 p.m. Institution of Heating and Ventilating Engineers, Birmingham & District Branch. Annual general meeting followed by "A Historic Review of the Development of Heating and Ventilating," by N. S. Billington.

BRISTOL.—I.E.E. Bristol Students' Section. Visit to B.B.C. Studios, Whiteladies Road, at 7.30 p.m.

CARLISLE.—King's Hall, Globe Lane, 7 p.m. I.E.E. North-Eastern Centre, district meeting. "The Possibilities of a Cross-Channel Power Link between the British and French Supply Systems," by D. P. Sayers, M. E. Laborde and F. J. Lane.

CHELMSFORD. — Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Colour Television," by L. C. Jesty.

EDINBURGH.—Department of Natural Philosophy, The University, 7 p.m. British Institution of Radio Engineers, Scottish Section. Symposium of three short papers by members of the Section.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Utilization and Supply Sections. "The Standardization of Retail Electricity Tariffs," by A. O. Johnson and N. F. Marsh. (Joint meeting.)

I.E.E. London Students' Section. Visit to Tate & Lyle, Ltd., Plaistow Refinery, Silvertown, at 2 p.m.

Electrical Wholesalers' Federation. Annual general meeting and annual dinner (6.30 for 7 p.m.) at the Dorchester Hotel.

PETERBOROUGH.—Campbell Hotel, Bridge Street, 7.30 p.m. Incorporated Plant Engineers, Peterborough Branch. Annual general meeting.

WATFORD. — Clarendon Hotel, 8 p.m. A.S.E.E. Watford Branch. "Earthing," by T. C. Gilbert.

Friday, 18th March

BLACKBURN.—Assembly Hall. Incorporated Plant Engineers, Blackburn Branch. Annual dinner.

HARROGATE.—Cairn Hydro Hotel, 7.15 for 8 p.m. I.E.E. North Midland Centre. Annual dinner and dance.

LEICESTER.—Grand Hotel. Leicester Electrical Society. Annual dinner-dance.

LONDON.—Caxton Hall, 6.30 p.m. E.P.E.A. Southern Meter Engineers' Group. "Brains Trust."

1, Birdcage Walk, S.W.1, 5.30 p.m. Institution of Mechanical Engineers. Annual general meeting.

MANCHESTER. — Engineers' Club, Albert Square, 6.30 p.m. Institution of Heating and Ventilating Engineers, Manchester & District Branch. Annual general meeting and chairman's address.

NEWCASTLE-UPON-TYNE. — King's College, 6.30 p.m. I.E.E. North Eastern Students' Section, Tyneside meeting. "Some Electronic Applications to Chemical Analysis," by M. S. Beck.

OLDHAM.—Osram-G.E.C., Shaw, 7.30 p.m. Institute of Industrial Supervisors, North-Western Section. "Electronics in Industry," by Mr. Atkinson.

Saturday, 19th March

LONDON.—I.E.E. London Students' Section. Visit to Odeon Theatre, Leicester Square, at 9.30 a.m.

E.I.B.A. Kent Branch

A general meeting of the Kent Branch of the Electrical Industries Benevolent Association will be held on 20th April next at 2.30 p.m. The meeting will be at Littlebrook generating station, Dartford, and after the meeting there will be a conducted tour of the station. Accommodation is limited and admission will be by ticket only. These should be obtained before 21st March from the hon. secretary of the E.I.B.A. Kent Committee, Mr. W. J. Collins, South Eastern Electricity Board, Fairview, Highgate, Hawkhurst, Kent.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 13th April from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1950

17570. General Electric Co., Ltd., and Francis, V. J.—Electric discharge lamps comprising thermionic electrodes. 13th July, 1951. (727885.)

23041. United Kingdom Atomic Energy Authority.—Metering and regulating systems. 10th September, 1951. (727964.)

24037. Research Corporation.—Electrostatic precipitators. 2nd October, 1950. (728041.)

28728. Soc. d'Electronique et d'Automatisme.—Electric code registering and calculating devices. 23rd November, 1950. (727887.)

1951

3710. N.S.F., Ltd., formerly British N.S.F. Co., Ltd., and Millikin, B. W.—Index mechanisms for rotary electric switches. 12th February, 1952. (728214.)

5339. Nalder Bros. & Thompson, Ltd. Shewan, J. R., and Eckett, S. W.—Protective systems for electrical equipment. 21st March, 1952. (727966.)

6706. El-Re-Ma Soc. Anon.—Electric calculating machines. 20th March, 1951. (727968.)

16802. Ateliers de Constructions Electriques de Charleroi, and Laporte, M.—Electric flash lamps. 16th July, 1951. (727895.)

20719. Parsons & Co., Ltd., C. A.—Combustion turbine regenerator seals. 5th August, 1952. (727973.)

22404. British Thomson-Houston Co., Ltd.—Semi-conductor P-N junction units and methods of making them. 25th September, 1951. (728129.) 22405. Asymmetrically conductive devices and methods of making them. 25th September, 1951. (727900.)

22802. English Electric Co., Ltd.—Processes and apparatus for welding using electric heating. 31st December, 1952. (727974.)

26909. Western Electric Co., Inc.—Semiconductor devices and methods of making them. 16th November, 1951. (728223.)

29159. Electric & Musical Industries, Ltd.—Circuit arrangements embodying electronic storage tubes. 1st December, 1952. (728050.)

29834. General Electric Co., Ltd., and Neill, T. R.—Cold cathode electric-discharge devices. 17th December, 1952. (727978.)

1952

897. Standard Telephones & Cables, Ltd.—Voltage indicator tube with two sensitivity ranges. 11th January, 1952. (728053.)

3500. Veritys, Ltd.—Electric lighting fittings. 16th April, 1953. (728055.)

4807. Aizenberg, L.—Electric alarm device. 23rd February, 1953. (727984.)

7125. English Electric Valve Co., Ltd.—Magnetrons. 23rd December, 1952. (727987.)

7569. Rothermel, Ltd.—Electro-acoustical transducers. 24th March, 1953. (727902.)

7773. General Electric Co., Ltd., and Sowter, A. B.—Cold-pressure welding. 13th March, 1953. (728139.)

8572. Electric Construction Co., Ltd.—Electrostatic precipitation of dust. 1st April, 1953. (728061.)

10780. National Research Development Corporation.—Electrical heating of crucibles or furnaces. 23rd July, 1953. (728065.)

13602. British Messier, Ltd.—Servomechanisms. 26th May, 1953. (728142.)

14976. Edison Swan Electric Co., Ltd.—Thermionic cathode discharge tubes. 22nd May, 1953. (728067.)

15066. Allmanna Svenska Elektriska Aktiebolaget.—Electromagnetic means for regulating the flow of molten metal through a tubular channel. 11th June, 1953. (728145.)

17924. Ferranti, Ltd.—Apparatus for measuring the intervals between electric pulses. 12th October, 1953. (728073.)

20351. Standard Telephones & Cables, Ltd.—Electrical information storage equipment. 13th August, 1952. (728154.)

20436. Sigmund Pumps, Ltd.—Combined pump and driving motor assembly. 17th July, 1953. (728077.)

20839. M-O Valve Co., Ltd., and Willshaw, W. E.—Resonant cavity magnetrons. 18th August, 1953. (728080.)

21689. South Wales Switchgear, Ltd., Nicholas, A. J., and Buttrey, R. N.—High voltage switching installations. 22nd July, 1953. (728156.)

22538. English Electric Co., Ltd.—Flexible drives. 4th September, 1953. (728238.)

23566. English Electric Co., Ltd.—Electrical frequency responsive relays. 18th September, 1953. (728002.)

26095. General Electric Co.—Germanium photocells. 17th October, 1952. (728244.)

26923. Babcock & Wilcox, Ltd.—Branched pipes or pipe fittings. 27th October, 1953. (728005.)

28418. British Insulated Callender's Cables, Ltd.—Machines for lapping tape, thread and like flexible material on to an electric conductor or other support. 10th November, 1953. (728087.)

28449. Raytheon Manufacturing Co.—Strapped multi-cavity magnetrons. 11th November, 1952. (727922.)

29048. Electric & Musical Industries, Ltd.—Adjustable electrical devices. 17th November, 1953. (728167.)

29360. Siemens-Schuckertwerke Akt-Ges.—Processes for the production of selenium rectifier plates. 20th November, 1952. (728088.)

30178. Kraus, E.—Electrical device for the grilling of foodstuffs. 28th November, 1952. (727924.)

31064. Mullard Radio Valve Co., Ltd.—Dummy load arrangements for radio frequency power measurements and the like. 8th December, 1952. (728170.)

32592. National Research Development Corporation. — Electromagnetic pick-off devices. 11th November, 1953. (727929.)

32646. Raytheon Manufacturing Co.—Duplexing equipment for radar systems and the like. 23rd December, 1952. (728090.)

1953

23. Sperry Gyroscope Co., Ltd.—Brushes for making and breaking with electrical contacts and in brush-contact assemblies. 13th November, 1953. (728011.)

2490. General Electric Co., Ltd., and Boswell, D.—Electric-discharge devices. 28th January, 1954. (728175.)

5880. British Thomson-Houston Co., Ltd.—Electric incandescent lamps. 1st March, 1954. (728263.)

7007. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Storage electron discharge devices. 13th March, 1953. (727937.)

7026. Siemens & Halske Akt.-Ges.—Circuit arrangement for telecommunication installations. 13th March, 1953. (728265.)

7683. Telegraph Construction & Maintenance Co., Ltd.—Electric cable heads, and process of manufacture thereof. 19th March 1953. (728100.)

9268. Gretener, E.—Device for producing current impulse combinations. 2nd April 1953. (728268.)

9877. Domecq, J. L.—Pivoted-link support for portable electric lamps and like devices. 10th April, 1953. (727941.)

10362. Radio Corporation of America.—Secondary electron emitter. 15th April, 1953. (728181.)

10932. Philips Electrical Industries Ltd.—Electric-discharge tubes. 21st April, 1953. (728182.)

11688. Aircraft-Marine Products, Ltd.—Electrical connectors. 28th April, 1953. (728184.)

12466. Compagnie Industrielle des Telephones.—Ladder type band filters. 5th May 1953. (728106.)

13844. Air Preheater Corporation.—Electrostatic precipitators. 18th May, 1953. (728185.)

14557. Telefunken Ges. für Drahtlose Telegraphie.—High tension supply circuits 26th May, 1953. (728024.)

14631. Naamlooze Vennootschap Fabrieken van Electrische Apparaten Voorheen J. Hazemeijer & Co.—Multi-phase alternating circuit breakers. 26th May, 1953. (728186.)

14934. Siemens-Schuckertwerke Akt.-Ges.—Production of selenium rectifier plates. 28th May, 1953. (727949.)

15843. Edison Swan Electric Co., Ltd.—Electric lighting fittings. 9th June, 1953. (728189.)

18236. Philips Electrical Industries, Ltd.—Glow-discharge switch tubes. 1st July, 1953. (728194.)

19227. Standard Telephones & Cables, Ltd.—Telephone receivers using click suppressors. 10th July, 1953. (728027.)

20704. Whitmarley Engineering Co., Ltd.—Electrically heated de-misters for windows. 23rd November, 1953. (728200.)

22746. Philips Electrical Industries, Ltd.—Methods of and devices for high-frequency heating. 18th August, 1953. (728204.)

22874. Philips Electrical Industries, Ltd.—Pulse-radar equipment. 19th August, 1953. (728112.)

23276. Standard Telephones & Cables, Ltd.—Pulse width discriminator circuits. 24th August, 1953. (728113.)

23297. General Electric Co.—Electrical vapour detectors. 24th August, 1953. (728114.)

36358. General Electric Co.—Crepe paper insulation for electric conductors. 31st December, 1953. (727960.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 16th March:

COLUMBUS. No. B640,576, Class 9. Electric vacuum cleaners. COLUMBUS. No. B648,654, Class 9. Electric vacuum cleaners and electric domestic polishing machines.—Rollnick & Gordon, Ltd., Capitol Works, Empire Way, Wembley, Middx.

VICEROY. No. 734,484, Class 9. Vacuum cleaning apparatus (electric).—Neptric, Ltd., 73-79, Hurst Street, Birmingham, 5.

ATOMCOM. No. 734,837, Class 9. Telephone and loudspeaker apparatus for intercommunication.—Neltic, Ltd., Neltic House, Charteris Road, London, N.4.

PLESSEYNATO. No. 736,380, Class 9. Electrical apparatus and instruments; and radio apparatus and instruments.—Plessey Co., Ltd., 56, Vicarage Lane, Ilford, Essex.

SUNBEAM (design). No. 731,162, Class 11. Electric lighting fittings and electric lamp reflectors, none being parts or fittings for vehicles or for electricity generating apparatus; and electric water heaters and electric fans.—G. D. Harrison & Sons, Ltd., 55, Northgate, Huddersfield.

PRESTWARM. No. 733,544, Class 11. Electrical space heating appliances.—R. H. Everest, Prestige House, Imperial Drive, Harrow, Middx.

GENERATION AND DEVELOPMENT

Large B.E.A. Contracts

Contracts amounting in the aggregate to £10,536,075 have been placed by the British Electricity Authority during the past month for power stations, transforming stations and transmission lines. They include the following:—

Belvedere power station, Erith. Two 60 MW turbo-generators.—English Electric Co.

Littlebrook "C" power station, Dartford. High pressure pipework and valves.—C. A. Parsons & Co.

Marchwood power station, near Southampton. One 60 MW turbo-generator.—English Electric Co.

Portishead "B" power station, near Bristol. One 60 MW turbo-generator.—Metropolitan-Vickers Electrical Co.; high pressure pipework and valves.—Stewarts & Lloyds.

Tilbury power station. 11 kV and lower voltage cables and accessories.—Malcolm & Allan (London).

Drakelow "B" power station, Burton-on-Trent. Foundations and roadworks.—M. J. Gleeson (Contractors).

Willington "A" power station, near Derby. 3·3 kV auxiliary switchgear.—English Electric Co.

Rogerstone power station, Mon.—Piling for main foundations.—A. Waddington & Son.

Ince power station, near Ellesmere Port. Four 550,000 lb/hr boilers.—International Combustion.

Elland power station, Yorks. One 60 MW turbo-generator.—Metropolitan-Vickers Electrical Co.

Ferrybridge "B" power station, Yorks. 415 V auxiliary switchgear.—Brookhirst Switchgear.

Skelton Grange "A" power station, Leeds. Second extension to circulating water culverts.—J. L. Kier & Co.

Wakefield "B" power station, Yorks. River works.—Mitchell Construction Co.

Stella North and Stella South power stations, near Newcastle-upon-Tyne. Main superstructures and ancillary buildings.—Sir Robert McAlpine & Sons (Newcastle-on-Tyne).

Chadderton power station, Oldham. High and low pressure pipework.—Stewarts & Lloyds.

Dalmarnock power station, Glasgow. Reinforced concrete chimney and supporting structure.—Tileman & Co.

North Hammersmith substation. Two 15 MVA 66/11 kV transformers.—Ferranti.

Herrington Burn substation. Two 75 MVA 132/66 kV main transformers and one auxiliary transformer.—Ferranti.

Manchester Grid Control Area. Standardized system of general indication and telephone equipment.—Automatic Telephone & Electric Co.

Blizzards in Scotland

Recent blizzards in Scotland gave the North of Scotland Hydro-Electric Board installations and repair services their most severe test since the Board was set up in 1943. With territory covering 21,700 square miles, over which it has built 1,130 circuit miles of 132 kV transmission line together with 11,162 miles of distribution lines serving almost 350,000 consumers, the Board is much more vulnerable to damage from heavy snow and severe icing than in its early days.

The second blizzard in February, a month after the first, was in some instances more severe. Every possible means of transport was used to help restore supplies, from fishing boats to helicopters and aeroplanes. Many of the Board's linesmen, aided in certain areas by contractors' workmen, performed heroic treks under almost Arctic conditions over rough, lonely country, where deep drifting had taken place.

In Orkney forty Hydro-Electric Board men worked all through the night of 18th February, in twelve degrees of frost, attempting to repair a severe breakdown. To reach the fault the men had to battle through drifts 10ft deep. On the same day Mr. J. D. Martin, deputy manager of the Board's Northern Area, was picked up at the football field, Dingwall, by a Naval helicopter from Lossiemouth and flown to Wick. He was able to examine damaged overhead lines while flying north.

At the height of the blizzard almost all consumers outside the town of Kirkwall were without supplies for periods varying up to 48 hours.

On Friday, 25th February, in order to survey storm damage effects on the 132 kV line which crosses the Corrieyairack Pass, the Board's South Caledonia Area engineers, in Perth, used a de Havilland Rapide aircraft from which they were able to see at a glance many miles of line traversing country completely inaccessible to ground squads.

The Hydro-Electric Board is now satisfied that its blizzard arrangements are such as to make possible speedy repairs no matter where, or under what conditions, breakdowns occur. A system of wireless control has been established while linesmen have proved themselves capable of withstanding the most rigorous conditions and of adapting modern methods of air travel to help them complete successfully their arduous ground duties.

Hire and Hire-Purchase

It was reported to the Eastern Electricity Consultative Council in London last Friday that its counterpart in the Midlands was considering simple hire of electric cookers as opposed to credit sale and was seeking information on the make-up of the quarterly hire charge, especially the specific allowances made for amortization, interest, overhead charges and maintenance.

Asked for a statement on the subject, the Eastern Board had said that cookers were mainly supplied under a seven-year hire-purchase scheme, which had proved very popular with consumers. It was recognized, however, that there would always be a number of consumers who, because of unsettled conditions or for other reasons, might prefer to hire a cooker. For this reason there were available in all Districts sufficient reconditioned cookers to meet the demand. These were mainly of pre-war manufacture but were in excellent condition and were offered for as little as a shilling a week. Because of the relatively low prices at which they were bought, the allowance in the hire charge for interest and repayment of capital was relatively small. If it became necessary to purchase cookers then clearly the rental charge would have to be much higher.

Alderman W. J. Bennett, chairman of the Council, said it might be that, as a result of changed conditions, more consideration would again have to be given to hire schemes. Where tenants had to provide cookers and other equipment themselves the new hire-purchase terms could prove a considerable burden.

Record Rural Development

For the first time since nationalization, the Eastern Electricity Board's expenditure on rural development is running at the rate of over £1,000,000 a year. Announcing this at the Eastern Electricity Consultative Council's meeting last week the chairman (Ald. W. J. Bennett) said that it was estimated that during the next six months £532,656 would be spent on this work.

He added that because of the rapid increase in the number of consumers in the Board's area extensive reinforcement of the mains was necessary. It was estimated that during the next six months £1,778,000 would be spent.

Power from Bhakra-Nangal

With the completion of the Ganguwal power house in North India the £100 million Bhakra-Nangal project may be said to be beginning its second phase. The power house, with an initial installed capacity of 48,000 kW, is the first to be completed and will soon be followed by another at Kotla, a few miles downstream of the Nangal Canal, on which it is situated. The Canal turns sharply near Ganguwal, thereby creating a fall of 98ft which has been utilized for power generation. Two sets of 24,000 kW have been installed at present, to be followed later by another of the same capacity. The power house at Kotla will also have an installed capacity of 72,000 kW (48,000 kW in the first stage). Within a year or so, therefore, the Bhakra-Nangal grid serving most of North India, including the capital, New Delhi, will be transmitting just under 100,000 kW, of which about 50,000 kW will be firm power.

The transmission grid, including about 200 miles of 220 kV line, will cost Rs 9 crores (£6·7 million) and the substations, etc., another 9 crores. All are in an advanced stage of completion and it is expected that New Delhi will be receiving its first supply of energy from Bhakra late this year.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Antrim.—23rd March. County Health Committee. Installation at extension to Finaghy Primary School. J. M'Candless, consulting engineer, 6, Murray Street, Belfast.

Australia.—5th April. Australia House, London, W.C.2. Diesel generating plant for telecommunication installations ranging from 1·5 to 200 kVA. (E.S.B. 4516/55. Ten/12784.)*

13th April. State Electricity Commission of Victoria. Coal handling plant for Yallourn power station. (E.S.B. 3517/55. Ten/12778.)*

Brazil.—28th March. Comissao Estadual de Energia Eletrica. 2,600 three-phase electricity meters. (E.S.B. 4346/55. Ten/12764.)*

Carlisle.—City Council. Electrical installation in crematorium. City engineer, 18, Fisher Street, Carlisle.

Durham.—18th March. County Council. Installation of electricity in divisional police headquarters at Whickham. County architect, Court Lane, Durham.

Formosa.—25th March. Central Trust of China, U.S. Aid Division, Taiwan. Storage battery plate manufacturing plant. (E.S.B. 3729/55. Ten/12801.)*

Halifax.—25th March. Corporation. Lighting equipment at stores for 1955/56. (See this issue.)

India.—31st March. Damodar Valley Corporation Electrical Department, Calcutta. Auxiliary equipment for Maithon hydro-electric power station. (E.S.B. 3995/55. Ten/12727.)*.

Iraq.—11th April. Directorate General of Municipalities, Bagdad. Two alternator sets, 500 kW and 250 kW respectively. (E.S.B. 4425/55. Ten/12802.)* Two 1,000 kVA transformers for Ramadi Electricity and Water Board. (E.S.B. 4426/55. Ten/12774.)* 12th April. Three 50 kW alternator sets for Heet. (E.S.B. 4427/55. Ten/12773.)* 16th April. One 200 kW generating set for Musayab. (E.S.B. 4428/55. Ten/12781.)*

Irish Republic.—18th May. Dublin Corporation. Four vertical spindle sewage pumps and electric motors for Clontarf pumping station. (E.S.B. 4271/55. Ten/12780.)*

Kuwait.—Government Electricity Department. Insulated cut-outs. (E.S.B. 4643/55. Ten/12831.)*

Midlothian.—18th March. County Council. Sodium lighting, Gorbridge Road. (See this issue.)

New Zealand.—19th April. Director General (Stores Division), General Post Office, Wellington. Capacitors. (E.S.B. 4310/55. Ten/12805.)* 26th April. Six single-channel carrier telephone systems. (E.S.B. 4307/55. Ten/12804.)*

25th June. State Hydro-Electric Department, Wellington. Transmission line towers. (E.S.B. 4308/55. Ten/12783.)*

Northern Ireland.—22nd March. Goods lift at Industrial Science Laboratories, Verner Street, Belfast, Ministry of Finance (Room 103), Law Courts Building, May Street, Belfast.

Plymouth.—14th April. City Council. Six electrically driven pumps and plant and equipment for water filtration works. N. G. Elliot, city water engineer, 22, Portland Square.

South Africa.—23rd March. Stores Department, South African Railways. Rectifier set or motor generator set for electro-plating duty. (E.S.B. 4239/55. Ten/12751.)* 30th March. Electrical catering equipment. (E.S.B. 4240/55. Ten/12752.)* 7th April. Goods/passenger elevator. (E.S.B. 452/55. Ten/12790.)*

Southern Rhodesia.—22nd March. Salisbury City Council. Line material and conductors. (E.S.B. 4571/55. Ten/12786.)* 5th April. Annual supply of switchgear, fuse gear and ancillary gear. (E.S.B. 4572/55. Ten/12787.)* Annual supply of transformers. (E.S.B. 4573/55. Ten/12785.)*

6th April. City of Bulawayo, Electricity Department. One hundred 230 V single-phase house service meters. (E.S.B. 4322/55. Ten/12755.)* 20th April. Outdoor 11 kV/400 V 3-phase power transformers. (E.S.B. 4321/55. Ten/12753.)*

Turkey.—22nd March. Headquarters, Allied Land Forces South Eastern Europe, P.K. 527, Izmir. Electric cable and wire. (E.S.B. 4773/55. Ten/12836.)*

* Specifications may be inspected at the Export Services Branch Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Aylesbury.—Corporation. Recommended. Street lighting, Oxford Road and Hartwell Road (£2,005).—G.E.C.

Chester.—City Council. Recommended. Electrical installation works at the Highfield Infants' School (£1,667).—Thomas Wood & Son (Chester).

Frome (Som).—U.D.C. Extension of sodium street lighting (£4,385).—Siemens Electric Lamps & Supplies.

Hartlepool.—Town Council. Street lighting in Milbank Crescent to Brougham Street (£2,102).—Revo Electric Co.

Higham Ferrers.—Corporation. Lighting of trunk road A.6 (£2,656).—Metropolitan-Vickers.

Willesden.—Borough Council. Installation of 311 group "A" road lighting units in the North Circular Road.—Cohen Bros. (Electrical).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bath.—Pithead baths and medical treatment centre, Braysdown Colliery, Peasdown; National Coal Board, Cambrian Buildings, Cardiff.

Birmingham District. — Development projects (£250,000) at Lea Castle Mental Deficiency Colony, Coventry and South Warwickshire Hospital, Selly Oak Hospital, Chelmsley Mental Deficiency Hospital and Dudley Road Hospital; Birmingham Regional Hospital Board, 10, Augustus Road, Edgbaston, 15.

Dorking.—Flats (27), houses (72), etc., at Goodwyns Farm estate, for U.D.C.; F. G. Sutherland, clerk, Council Offices, Pippbrook, Dorking.

Durham.—Clinic at Durham City for the C.C. (£14,000); county architect, Court Lane.

Reorganization of Auton Stile depot, including garages, stores and workshops (£37,000); A. C. Wildsmith, chief engineer, Durham County Water Board, Neville Court.

Eastbourne.—Housing estate, Ratton; Anderida, Ltd., 119, South Street.

Essex.—Completion of secondary school, Dovercourt Hill, Harwich (£90,000), first section of scheme for North Walthamstow Technical School (£75,000), second portion of scheme for technical college, Colchester (£40,000), and primary school, Wanstead (£35,000); H. Conolly, county architect, Chelmsford.

Holland (Lincs).—Conversion of Gosberton House into special school (£42,795), secondary modern schools at Holbeach (£152,542), Kirton (£17,500) and Long Sutton (£187,000), and primary school at Wyberton (£35,696); county architect, Boston.

King's Lynn.—Office block at rear of Guildhall; borough surveyor.

Lewes (Sussex).—Additions to Lewes Grammar School for Girls (£56,000); E. A. Verger, county architect, County Hall.

London.—Showrooms and offices, Mayfair; Vyse, Sons & Co., Ltd., Great Marlborough Street, W.1.

Office block, 29-30, Berkeley Square; F. G. Minter, Ltd., 4, Buckingham Gate, S.W.1.

Oldham.—Proposed Central ante-natal and welfare clinic at West Street (£30,000); borough engineer.

Ormskirk.—Houses (555), Scot estate; U.D.C. surveyor, Burscough Street.

Sacriston (Co. Durham).—Cinema; Eltringham and Lowes, architects, Derwent Street, Blackhill.

Seaton Valley.—Houses (64), Seghill Station, for U.D.C.; T. W. Burgess, surveyor, Council Offices, Seaton Delaval.

Slough.—Houses (50), Cippenham Lane; E. Gardner Thorp, borough surveyor.

South Ockendon.—Hospital block at South Ockendon Hospital (£70,000); regional architect, North East Metropolitan Regional Hospital Board, 3, Queen Anne Street, London, W.1.

South Shields.—Bus station, Mile End Road and improvements to houses (228), Cleadon Park, including electrical installations; borough engineer.

Trowbridge.—Council offices for U.D.C.; Snailum Huggins and Le Fevre, architects, 18, Brock Street, Bath.

Walsall.—Development of corner site, Rowland Street/Bentley Lane, for showrooms, workshops, stores, etc.; A. E. & F. Brittain, motor engineers, Bentley Lane.

Wealdstone.—Office block, Peel Road; Bierrum & Partners, Ltd., 10, Sudbury Hill, Harrow.

Welshpool.—Houses and flats (60), on the Oldford site; town clerk.

Whitehaven.—Hospital at Homewood House estate, for Newcastle-on-Tyne Regional Hospital Board; C. B. Pearson & Son, architects, 18, Dalton Square, Lancaster.

Winchester.—County offices proposed at Westgate (£536,360); C. Cowles Voysey, architect, 2, Bunkers Hill, London, N.W.11.

Wisbech.—Queen's Secondary Boys' School (£209,963); county architect, March, Cambs.

Worksop.—Houses (110) and flats, Kilton Hill estate and bungalows (50) in Valley Road for aged persons; borough surveyor, Park House.

New secondary technical school for Notts County Council; Greenwoods (Mansfield), Ltd., 2, Wood Street, Mansfield.

Wrotham (Kent).—Additions to Wrotham Secondary School (£98,500); county architect, County Offices, Springfield, Maidstone.

Yorks (North Riding).—Nine secondary schools and three primary schools (£1,311,182); county architect, Northallerton.